BIRDS
OF
PREY

OPERATIONS MANUAL

Argonaut Software

Back in 1982. Argonaut Software started life as one-man company run by Jez San from his bedroom. By 1991, Argonaut has grow into a large 10,000 sq. foot office in North London, employing nearly 30 people and specialising in 3D games and simulations. We seem to double in size each year, moving office faster than we can print business cards.

Now we have diversified into researching future gaming concepts. This consists of development systems using both hardware and software techniques, and serious state of the art 3D graphics on a variety of computers and video game consoles.

Argonaut's future interests are varied, including multimedia data capture and processing, video and audio compression, photorealistic graphics and unbelievably realistic sound-stage imaging. It's hard to think what we will be up to a few years from now ....

Birds of Prey has taken the best part of 4 years to develop, and over 12 man-years of work. Most of the time spent developing and researching the realistic flight and strategy of all the dynamic elements of the game. All that effort has culminated in what we think is an extremely realistic and capable flight simulator game. To recoup that amount of development investment in royalties we will probably have to sell 5 copies to every games player in the solar system. It's hard to believe we could ever afford to do a project this massive again, but who knows?

Anti-clockwise from the top left: Rick Clucas, Ian Crowther, Adam Polanski, Chris Humphries, Giles Goddard, Danny Emmett, Pete Warnes, Jez San

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Chapter 1:

Welcome

Overview

Experience Every Aspect Of Modern Air Combat

When imagining air combat, it's often the fighter aircraft that first springs to mind. No doubt the agility and high-speed of a dedicated fighter or interceptor — kind of a sports car in the sky — imbues it with a certain amount of well-deserved glamour. But air warfare involves considerably more than intercepting enemy aircraft, escorting bombers, and winning air superiority. It takes the coordinated use of many types of aircraft — flying very different kinds of missions — to make air power an effective tool of war.

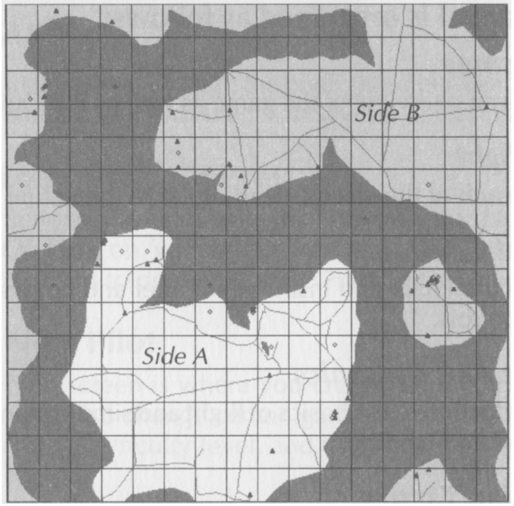
It's true that aircraft can't seize or occupy territory, but they can help ground forces achieve these objectives. On the battlefield, ground attack aircraft armed with tank-busting missiles and cannon are needed to direct firepower at enemy forces. Transport aircraft must deliver supplies to friendly forces and drop paratroopers behind enemy lines. Enemy airbases, factories, and cities must be debilitated via surgical strikes and long-range bombing sorties. Finally, high-speed reconnaissance aircraft are required to successfully gather information on enemy firepower.

Birds Of Prey is a unique air warfare simulation that gives you a cockpit view of all aspects of air combat. It models some of the best aircraft serving in air forces across the world.

The Campaign — East vs. West

Each mission you fly is part of a total war between two forces, Side A and Side B. Side A is equipped with hardware from NATO and other countries allied with the west, while Side B is equipped with Soviet aircraft and armaments.

Each side has a limited number of aircraft, airbases, radar stations, SAM sites, factories, and cities with which to wage war. As you destroy enemy locations and equipment, you limit the amount of offensive and defensive action the enemy can take. Attack his radar stations and he'll be blind to further attacks. Destroy his SAM sites and you've eliminated a vital part of his airfield protection. Blow up his runways, hangars, and control towers to knock out his airbases. Finally, reduce his ability to rearm himself by destroying his factories and cities.



The idea is to pound the other side so severely that it can no longer effectively wage war.

Each Pilot Fights His Own War

Each campaign is tied to a pilot. If you want to start a new campaign, you need only create a new pilot. Likewise, if your pilot is killed in combat, that campaign is over (though a pilot saved to disk always has another chance!)

No pilot is restricted by the *types* of missions he can fly. The same pilot can fly bombing missions, intercept enemy pilots, drop supplies, etc.

Using This Manual

You don't need to read this manual to start playing. If you're familiar with flight simulations, you may only need to look at the keyboard command diagram on the Command Summary Card as you take to the air. Perhaps the easiest way to jump into the cockpit is to let the Quickstart section in this chapter guide you through an air superiority mission. The Quickstart will introduce you to important controls and game concepts as well as indicate places in this manual where you can look for further information.

The manual is organized as follows:

1 Welcome

Provides an overview of the game as well as the Quickstart mission.

2 Preflight

Details each of the screens leading up to the actual mission.

3 Flight Controls

Explains the HUD and Instrument Panel and covers all aircraft and game controls.

4 Basic Aerodynamics

An introduction to the basics of flight and simple manoeuvres such as taking off and landing.

5 Mission Tactics

Explains general mission tactics as well as specific manoeuvres you can use to achieve mission objectives.

6 Technical Reference

Provides technical data on all aircraft and weapons found in the game. This is where you'll find answers to copy protection questions.

PC Users Without A Mouse: Some instructions in this manual assume that you have a mouse. If you don't have a mouse, see your *Command Summary Card* for instructions on keyboard commands that emulate a mouse.

Quickstart

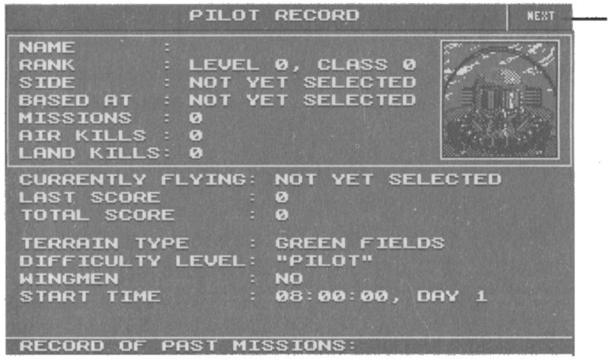
The Quickstart leads you through the preflight screens and then helps you attack and defend yourself against several Soviet opponents.

Install & Load Birds Of Prey

Use the instructions on your Command Summary Card to install and load ***Birds Of Prey*** on your computer. The instructions explain everything you need to do to get to the Pilot Record screen.

Create A New Pilot

The Pilot Record screen is where you create, load, and save pilots (games). You can also change certain game parameters like graphic detail, terrain type, difficulty level, and the presence of wingmen.



```
                 PILOT RECORD
NAME         :
RANK         : LEVEL 0, CLASS 0
SIDE         : NOT YET SELECTED
BASED AT     : NOT YET SELECTED
MISSIONS     : 0
AIR KILLS    : 0
LAND KILLS:  0
CURRENTLY FLYING: NOT YET SELECTED
LAST SCORE      : 0
TOTAL SCORE     : 0
TERRAIN TYPE    : GREEN FIELDS
DIFFICULTY LEVEL: "PILOT"
WINGMEN         : NO
START TIME      : 08:00:00, DAY 1
RECORD OF PAST MISSIONS:
```

Go To Next Screen

Type a name for your pilot and press **Return**. Since this is your first mission, you're going to change the difficulty level to its easiest setting and add wingmen to your flight. Press **D** until "Rookie" appears next to Difficulty Level, and then press **W** to fly this mission with wingmen.

You're now ready to select a mission. To go to the Choose Mission Type screen, press the **spacebar** or left-click on the **Next** button.

Most options have both a mouse and a keyboard interface. To see the interface for each preflight screen, see ***Chapter 2: Preflight.***

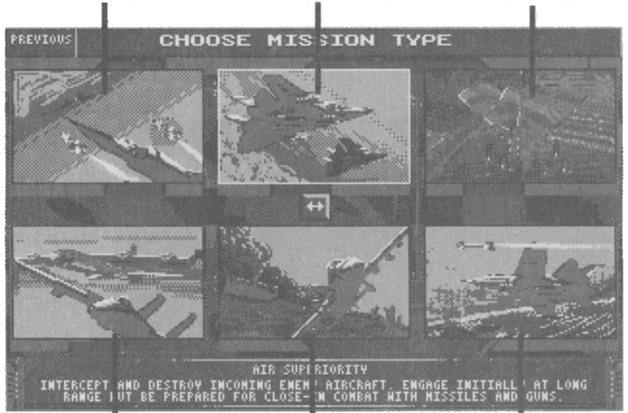
Choose A Mission

Though you only see one Choose Mission Type screen, there are actually two screens displaying six mission types — 12 types in all.

You're going to fly an air superiority mission. If you move the cursor over the air superiority window, you'll see that your mission objectives are simple: to intercept and engage enemy fighters at long range, moving in to close range if necessary.

To go to the next screen, press **2** or left-click on the air superiority window.

Air Interception *Air Superiority* *Long Range Bombing*

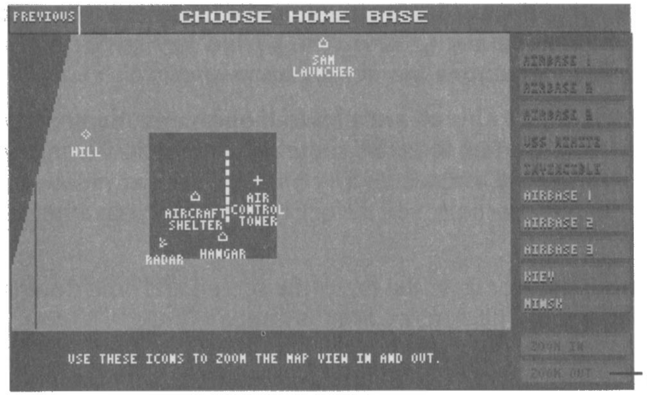

PREVIOUS
CHOOSE MISSION TYPE

AIR SUPERIORITY
INTERCEPT AND DESTROY INCOMING ENEMY AIRCRAFT. ENGAGE INITIALLY AT LONG RANGE BUT BE PREPARED FOR CLOSE-IN COMBAT WITH MISSILES AND GUNS.

Bomber Escort *Close Support And Ground Attack* *Border Or Sea Patrol*

Choose A Home Base

At the moment, your pilot doesn't belong to either side. The Choose Home Base screen lets you designate which side this pilot is fighting on as well as where he's based. Left-click several times on the **Zoom Out** option until you can see the whole world.


PREVIOUS
CHOOSE HOME BASE
SAM LAUNCHER
HILL
AIRCRAFT SHELTER
AIR CONTROL TOWER
RADAR
HANGAR
AIRBASE 1
AIRBASE 2
AIRBASE 3
KIEV
MINSK
ZOOM IN
ZOOM OUT

USE THESE ICONS TO ZOOM THE MAP VIEW IN AND OUT.

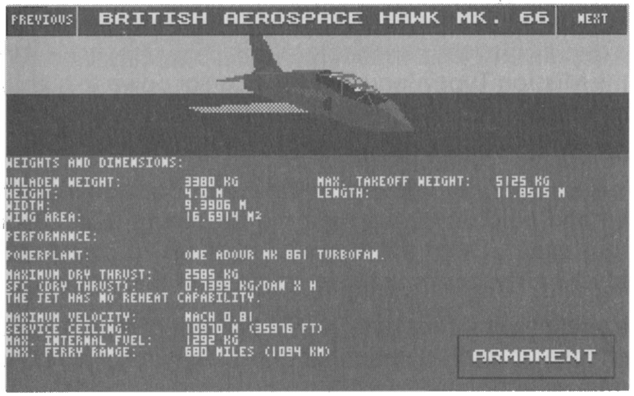
Left-Click On The Zoom Out Option

The map shows you the location of targets — airbases, carriers, radar stations, SAM sites, cities and factories — as well as landscape features such as hills and canyons.

You're going to fight for Side A in this mission. Left-click on the **Airbase 1** option.

Choose An Aircraft

There are 27 aircraft in Side A's inventory from which to choose. The BAe Hawk is currently displayed.

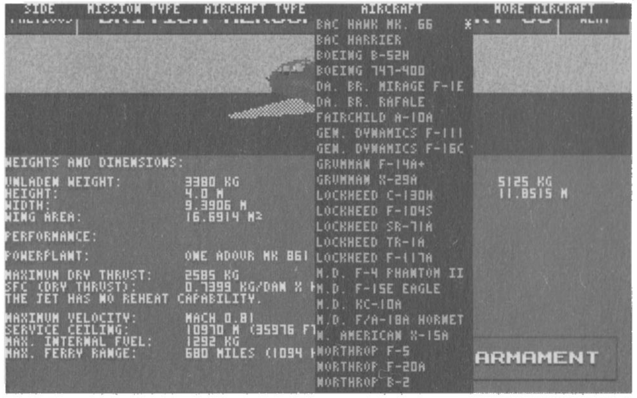

PREVIOUS
BRITISH AEROSPACE HAWK MK. 66
NEXT
ARMAMENT

```
WEIGHTS AND DIMENSIONS:

UNLADEN WEIGHT:        3380 KG           MAX. TAKEOFF WEIGHT:   5125 KG
HEIGHT:                4.0 M             LENGTH:                11.8515 M
WIDTH:                 9.3906 M
WING AREA:             16.6914 M²

PERFORMANCE:

POWERPLANT:            ONE ADOUR MK 861 TURBOFAN.

MAXIMUM DRY THRUST:    2585 KG
SFC (DRY THRUST):      0.7399 KG/DAN X H
THE JET HAS NO REHEAT CAPABILITY.

MAXIMUM VELOCITY:      MACH 0.81
SERVICE CEILING:       10970 M (35976 FT)
MAX. INTERNAL FUEL:    1292 KG
MAX. FERRY RANGE:      680 MILES (1094 KM)
```

To display each of the available aircraft in the inventory list, use the **period** (.) and **comma** key (,) keys. The **period** key scrolls *forward* through the list; the **comma** key scrolls *backwards.*

As you'll discover, 27 aircraft are a lot to look at, and many of them are entirely inappropriate to an air superiority mission. To help you choose an appropriate aircraft for any mission, special menus have been provided. These help you select by *limiting* your choice of aircraft.

Move the mouse cursor up to the top of the screen and hold down the right mouse button. The Aircraft Menus appear:


SIDE
MISSION TYPE
AIRCRAFT TYPE
AIRCRAFT
MORE AIRCRAFT
BAC HAWK MK. 66
BAC HARRIER
BOEING B-52H
BOEING 747-400
DA. BR. MIRAGE F-1E
DA. BR. RAFALE
FAIRCHILD A-10A
GEN. DYNAMICS F-111
GEN. DYNAMICS F-16C
GRUMMAN F-14A+
GRUMMAN X-29A
LOCKHEED C-130H
LOCKHEED F-104S
LOCKHEED SR-71A
LOCKHEED TR-1A
LOCKHEED F-117A
M.D. F-4 PHANTOM II
M.D. F-15E EAGLE
M.D. KC-10A
M.D. F/A-18A HORNET
N. AMERICAN X-15A
NORTHROP F-5
NORTHROP F-20A
NORTHROP B-2
ARMAMENT

```
WEIGHTS AND DIMENSIONS:
UNLADEN WEIGHT:          3380 KG                                 5125 KG
HEIGHT:                  4.0 M                                   11.8515 M
WIDTH:                   9.3906 M
WING AREA:               16.6914 M²
PERFORMANCE:
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MAXIMUM DRY THRUST:      2585 KG
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MAX. INTERNAL FUEL:      1292 KG
MAX. FERRY RANGE:        680 MILES (1094 H
```

Move the mouse over to the Aircraft and More Aircraft Menus. These list all of the aircraft currently available to you. Now move the cursor left over to the Mission Type Menu. Drag the cursor down to highlight the **Air Superiority** option and release the mouse button.

You've now limited your choice of aircraft to those capable of fulfilling the air superiority role. Move the cursor back up to the top of the screen and hold down the right mouse button to access the Aircraft Menus again. Open the Aircraft Menu again. You'll notice that now only 13 air superiority fighters appear in the menus.

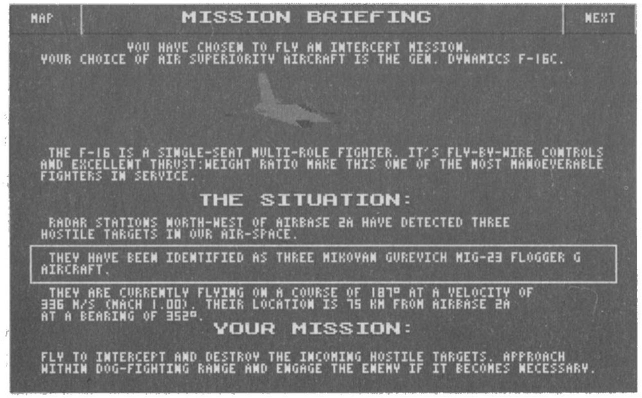
Any of these aircraft are appropriate, but for the sake of this Quickstart mission we'll take up an F-16. Highlight **Gen. Dynamics F-16C** and release the mouse button.

The F-16 is a fast, highly-manoeuvrable multi-role fighter capable of carrying a large variety of weapons. To take a look at the kinds of weapons it can carry, press **A** or left-click on the **Armaments** button.

When you're done reviewing the weapons the F-16 can carry, press A again or left-click on the **Aircraft** button. You're now ready to receive your mission briefing. Press the **spacebar** or left-click on the **Next** button.

Mission Briefing

Read the briefing carefully, paying close attention to the types of opponents you're facing, their reported distance, and their bearing. If you want to know more about the kind of aircraft their flying, turn to the *Soviet Aircraft* section in ***Chapter 6: Technical Reference.***

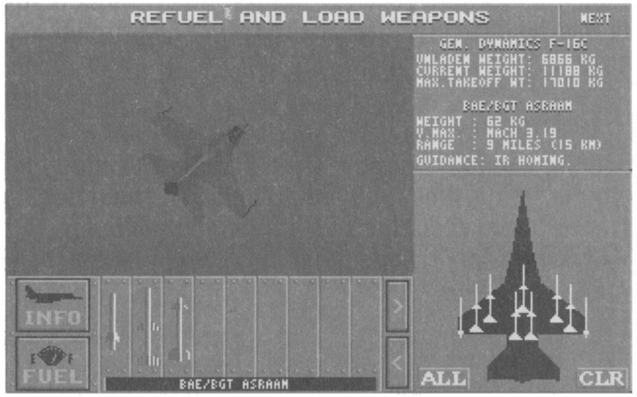


```
MISSION BRIEFING

YOU HAVE CHOSEN TO FLY AN INTERCEPT MISSION.
YOUR CHOICE OF AIR SUPERIORITY AIRCRAFT IS THE GEN. DYNAMICS F-16C.

THE F-16 IS A SINGLE-SEAT MULTI-ROLE FIGHTER. IT'S FLY-BY-WIRE CONTROLS
AND EXCELLENT THRUST:WEIGHT RATIO MAKE THIS ONE OF THE MOST MANOEVERABLE
FIGHTERS IN SERVICE.

THE SITUATION:

RADAR STATIONS NORTH-WEST OF AIRBASE 2A HAVE DETECTED THREE
HOSTILE TARGETS IN OUR AIR-SPACE.

THEY HAVE BEEN IDENTIFIED AS THREE MIKOYAN GUREVICH MIG-23 FLOGGER G
AIRCRAFT.

THEY ARE CURRENTLY FLYING ON A COURSE OF 187° AT A VELOCITY OF
336 M/S (MACH 1.00). THEIR LOCATION IS 75 KM FROM AIRBASE 2A
AT A BEARING OF 352°.
YOUR MISSION:

FLY TO INTERCEPT AND DESTROY THE INCOMING HOSTILE TARGETS. APPROACH
WITHIN DOG-FIGHTING RANGE AND ENGAGE THE ENEMY IF IT BECOMES NECESSARY.
```

You're now ready to arm your aircraft. Press the **spacebar** or left-click on the **Next** button.

Arm Your Aircraft

The Refuel And Load Weapons screen is where you choose weapons for your mission and adjust fuel levels.



REFUEL AND LOAD WEAPONS

GEN. DYNAMICS F-16C
UNLADEN WEIGHT: 6866 KG
CURRENT WEIGHT: 11188 KG
MAX.TAKEOFF WT: 17010 KG

BAE/BGT ASRAAM
WEIGHT : 62 KG
V.MAX. : MACH 3.19
RANGE : 9 MILES (15 KM)
GUIDANCE: IR HOMING.

BAE/BGT ASRAAM

NEXT
INFO
E F
FUEL
>
<
ALL
CLR

Your aircraft's internal fuel tank is automatically filled when you come to this screen. Since the incoming enemy aircraft are probably within 150 km, you won't need any additional fuel in external tanks.

You will need weapons, however. Your role in this mission is to engage enemy aircraft, so you'll need a lot of air-to-air missiles. Click on the second missile from the left.

The cursor turns into a small missile icon and a description of the weapon appears in the upper right corner. You've just selected the AIM-120A Advanced Medium-Range Air-to-Air Missile. With a range of 48 km, this missile will give you an advantage to all but the most powerful Soviet air-to-air missiles. Point the missile cursor at the **All** button and click a mouse button.

Since AMRAAMs are radar-guided, they'll alert their target as they home in for the kill, thus giving him the chance to take countermeasures. You may also want to take along some infrared-guided (IR homing) missiles, which silently track the target's engine heat.

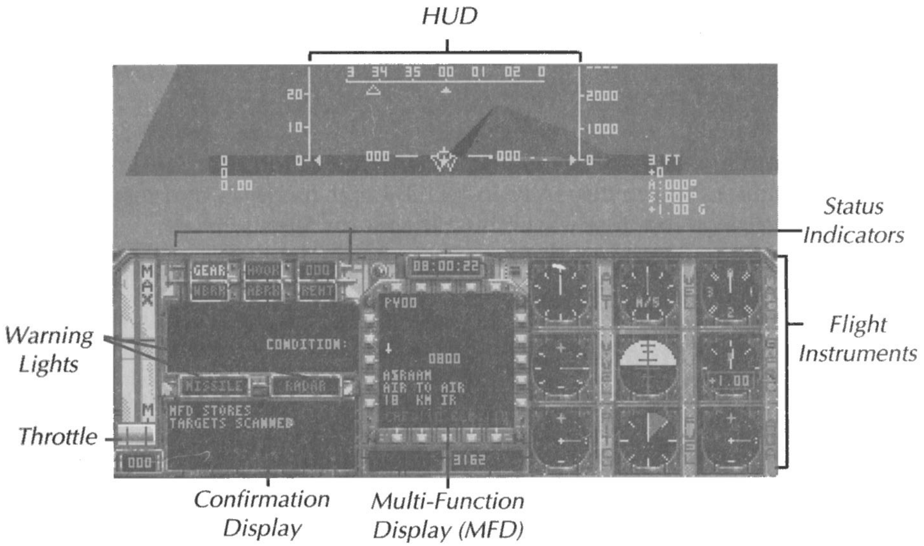
To add some IR-homing missiles, you'll need to remove a few AIM-120s. Point to missile on the left wingtip of the Aircraft Schematic and click the right mouse button.

Remove the missile on the right wingtip as well. Click on the missile furthest to the left to select the IR-homing ASRAAM. Now load ASRAAMs onto the two empty pylons.

To begin your mission, press the **spacebar** or click on the **Next** button.

You Begin In The Hangar

When the hangar doors open, you're ready to take off. But before you do that, take a minute to familiarize yourself with the HUD, Instrument Panel, and some important controls.

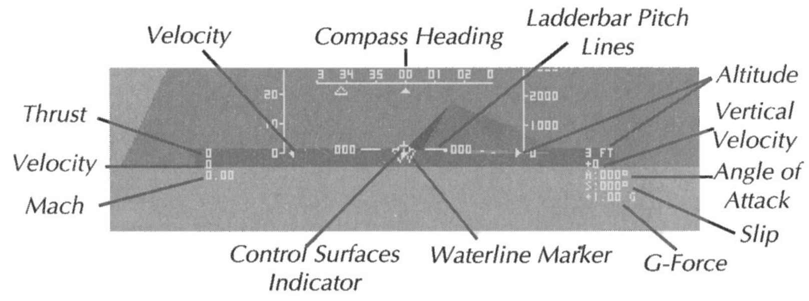


HUD
Status Indicators
Flight Instruments
Warning Lights
Throttle
Confirmation Display
Multi-Function Display (MFD)
GEAR
MISSILE
RADAR
CONDITION:
MFD STORES
TARGETS SCANNED
08:00:22
ASRAAM
AIR TO AIR
18 KM IR
MAX

> ### *The Pause Key*
>
> To pause the game while you get to know the cockpit, press the **backspace** key (←). In fact, use the Pause key liberally as you go through the Quickstart.
>
> Press any other key to go back to the mission.

HUD

Projected onto your windscreen is the Head-Up-Display (HUD), which provides you with important flight and target information.


Velocity
Compass Heading
Ladderbar Pitch Lines
Altitude
Thrust
Vertical Velocity
Velocity
Angle of Attack
Mach
Slip
Control Surfaces Indicator
Waterline Marker
G-Force

There are four HUD modes: Radar, Navigation, Bomb-Aimer, and Landing. You're currently in HUD Radar mode — that means that your radar is actively searching the air for targets.

For more detailed explanations of HUD symbols, turn to *Head-Up-Display (HUD)* in ***Chapter 3: Flight Controls***.

Flight Instruments

The Flight Instruments are a group of gauges that display much of the same information as the HUD: altitude, velocity, Mach, etc. Since this information is more easily obtained from the HUD, it's recommended that you look there for performance information while flying.

For more detailed explanations of Flight Instruments, turn to **Flight Instruments** under *Instrument Panel* in ***Chapter 3: Flight Controls***.

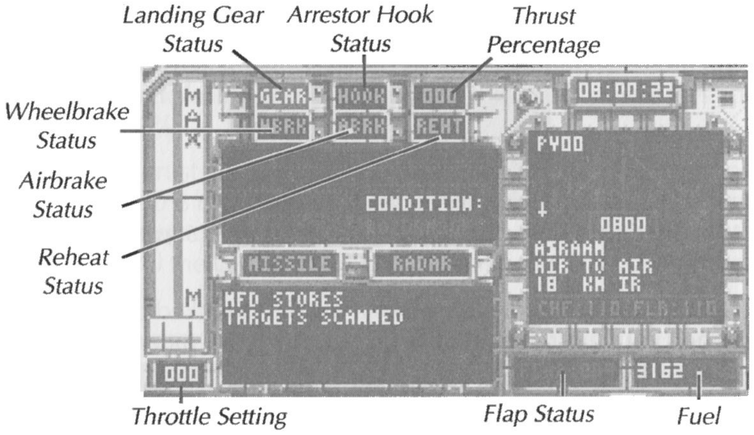
Multi-Function Display (MFD)

The MFD lets you switch between four displays: Stores, Radar, Navigation, and Map. You're currently in MFD Stores mode, which displays all of the weapons currently carried by your aircraft.

For more detailed explanations of Flight Instruments, turn to **Multi-Function Display (MFD)** under *Instrument Panel* in ***Chapter 3: Flight Controls***.

Status Indicators

The Status Indicators indicate the status of certain important systems.

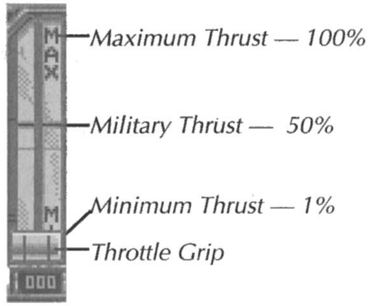

Landing Gear Status
Arrestor Hook Status
Thrust Percentage
Wheelbrake Status
Airbrake Status
Reheat Status
GEAR
HOOK
WBRK
ABRK
REHT
08:00:22
CONDITION:
MISSILE
RADAR
MFD STORES
TARGETS SCANNED
ASRAAM
AIR TO AIR
18 KM IR
3162
Throttle Setting
Flap Status
Fuel

The Reheat, Airbrake, Wheelbrake, Landing Gear, and Arrestor Hook Status Indicators are simple — either they're illuminated, meaning the system is active, or darkened, meaning the system is inactive. The Flap Status Indicator displays your current flap setting, and the Fuel Indicator displays the current amount of fuel you have left. The Thrust Percentage and Throttle Setting Indicators tell you the status of your engines.

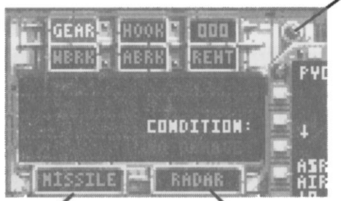
For more detailed explanations of each of the Status Indicators, turn to **Status Indicators** under *Instrument Panel* in ***Chapter 3: Flight Controls***.

Throttle

The throttle grip indicates your current throttle setting.


Maximum Thrust — 100%
Military Thrust — 50%
Minimum Thrust — 1%
Throttle Grip

Warning Lights


GEAR
HOOK
000
WBRK
ABRK
REHT
CONDITION:
MISSILE
RADAR
PYD
ASR
AIR

Stall Warning Signal

Missile Warning Signal

Target Warning Signal

The Warning Lights flash when a missile is locked on your airplane, when your aircraft has stalled, and when your radar has detected an enemy target.

Select Easy Flight

There's no use making the control of your aircraft difficult on your first mission. Hold down the right mouse button to bring up the Flight Menus. Move the cursor up to the Game Menu and highlight **Easy Flight**. Release the mouse button.

Click the left mouse button to continue the mission.

Take Off

Using the following instructions, you'll learn how to take off on the shortest amount of runway possible.

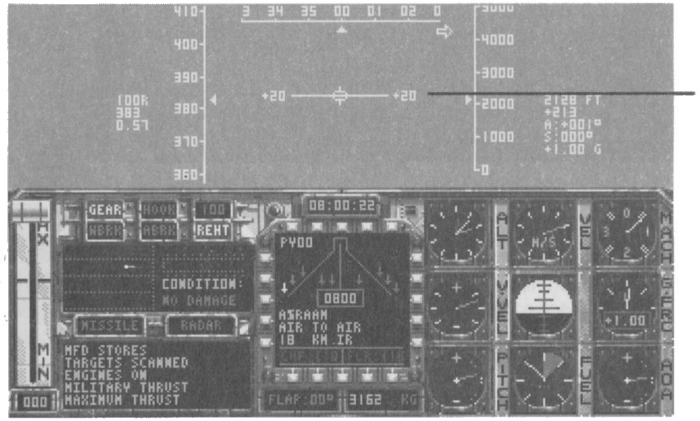
Flight Stick Control

You can control the aircraft's flight stick with a mouse, joystick, or the keyboard. Which control device you use is as much a matter of preference as what your computer is equipped with. Since different players will use different control devices, this Quickstart simply refers to "the flight stick." Turn to *Flight Stick Control* in ***Chapter 3: Flight Control*** for details on how to control your aircraft with a mouse, joystick, or the keyboard.

Press **J** to turn on your engines. Press the **equal** key (=) a couple of times until the Throttle Setting on the HUD or below the Throttle is somewhere between 9 and 15. Let your aircraft taxi out of the hangar.

Use the rudders (**Del** and **Help**) to manoeuvre your aircraft to the beginning of the runway. When you get to the beginning of the runway, press and hold down **B**. This activates the wheelbrake, which prevents your aircraft from rolling forward (the Wheelbrake Status Indicator shows that the brake is on). While continuing to hold down **B**, press the **backslash** key (\) twice. This automatically increases your throttle to 100%.

Watch the Thrust Percentage Indicator. When the engines have created the 100% thrust you called for, release the **B** key. Wait until your F-16 has reached about 160 knots, and then pull back on the flight stick until the Ladderbar Pitch Lines indicates that your aircraft is at 20° pitch.


410
400
390
380
370
360
3 34 35 00 01 02 0
+20
+20
100R
383
0.57
4000
3000
2000
1000
0
2128 FT
+213
A:+001°
S:000°
+1.00 G
GEAR
HOOK
100
WBRK
ABRK
REHT
08:00:22
CONDITION:
NO DAMAGE
MISSILE
RADAR
PYDD
0800
ASRAAM
AIR TO AIR
18 KM IR
MAX
MIN
000
FLAP:00°
3162 KG
ALT
VEL
MACH
V-VEL
G-FRC
PITCH
FUEL
AOA
+1.00

```
MFD STORES
TARGETS SCANNED
ENGINES ON
MILITARY THRUST
MAXIMUM THRUST
```

20° Pitch

Once your F-16 is off the ground, press **U** to raise the undercarriage.

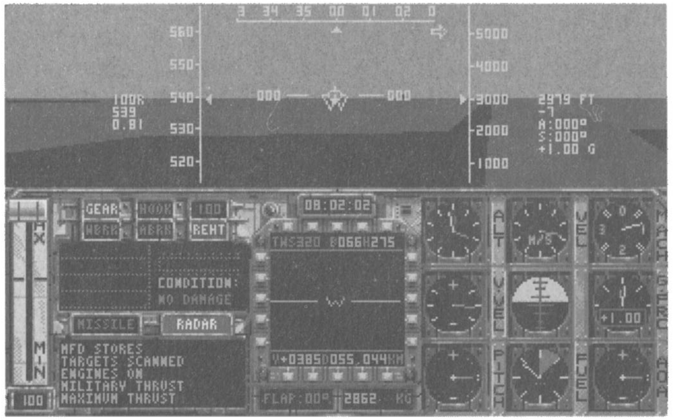
Level Off At 5000' Feet & Reduce Speed

Let the aircraft climb to around 5000', and then gently push the flight stick forward so that the horizon is level with the top of the Waterline Marker (pitch = 000°). Don't worry if your aircraft continues to climb slightly.

You can now reduce speed. Press the **minus** key (-) until the Throttle Setting is between 30-35.

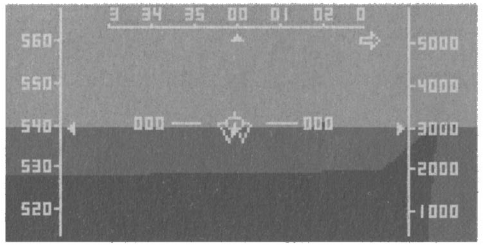
Switch to MFD Radar

The flashing Target Warning Light and slow beeping sound indicate that your radar has picked up targets. Press **M** to switch to MFD Radar mode — the display should look like this:

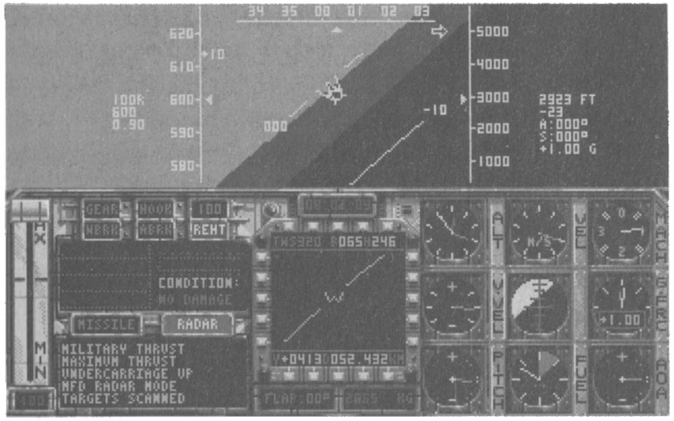

GEAR
HOOK
REHT
CONDITION:
NO DAMAGE
MISSILE
RADAR
MFD STORES
TARGETS SCANNED
ENGINES ON
MILITARY THRUST
MAXIMUM THRUST
08:02:02
2919 FT
ALT
VEL
PITCH
FUEL

Turn To Intercept Incoming Enemy Aircraft

The objects won't appear on the display or on the HUD until your aircraft is pointed more or less at it. If no objects currently appear on your display, look to the top of your HUD to see which direction you should turn to intercept the aircraft.



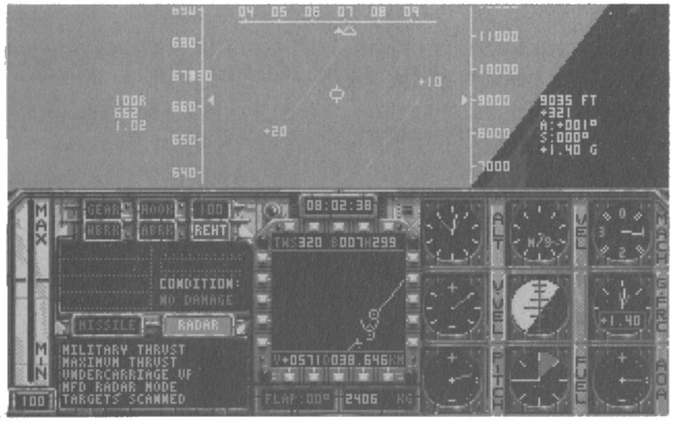
To turn, gently move the flight stick left or right. When the plane has banked about 60°, centre the flight stick again.


2923 FT
CONDITION:
NO DAMAGE
MISSILE
RADAR
MILITARY THRUST
MAXIMUM THRUST
UNDERCARRIAGE UP
MFD RADAR MODE
TARGETS SCANNED

Flight Stick Centred In 60° Turn

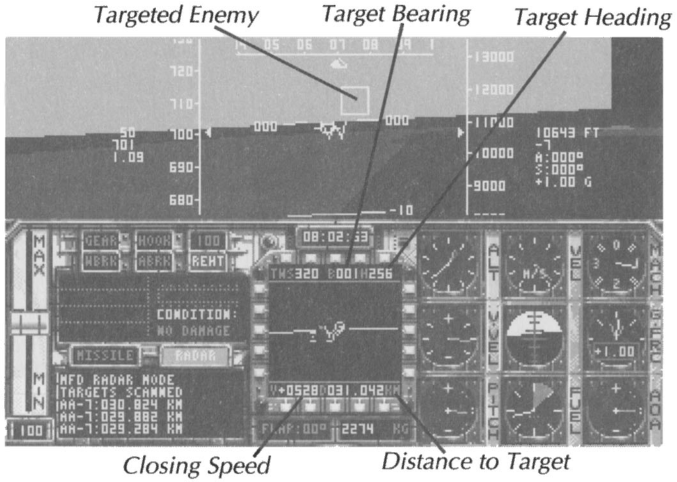
> *"Gentle" is the key term when performing any aircraft manoeuvre. Be easy on the flight stick when climbing, diving, or turning. The best method is to move the flight stick, centre it again, and then wait to see what effect this has on your flight path.*

Pull back gently on the flight stick to haul the nose around. Keep an eye on the top of the HUD. When the triangle appears at the top of the HUD, the object is somewhere on the screen. Continue to turn until the triangle is somewhere near the centre of the Compass.


9035 FT
08:02:38
CONDITION:
NO DAMAGE
MISSILE
RADAR
MILITARY THRUST
MAXIMUM THRUST
UNDERCARRIAGE UP
MFD RADAR MODE
TARGETS SCANNED

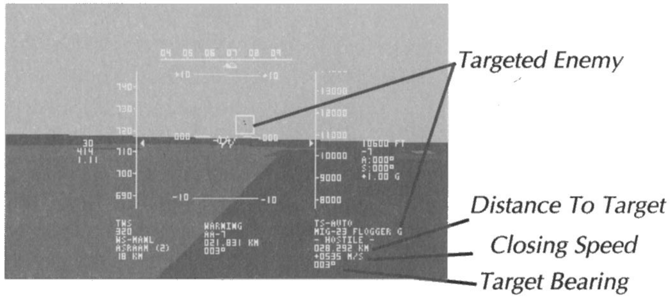
Centre the flight stick again, roll the aircraft the opposite direction, and then adjust pitch so that you're in level flight. You may find that you've increased altitude — don't worry about it as long as the target is still in sight.

At this point the enemy aircraft should be targeted on the MFD and on the HUD.



If you don't see the enemy aircraft, your Instrument Panel may be in the way. Press **W** to hide the Instrument Panel. Some players prefer flying without the Instrument Panel because it gives them the greatest view of the combat environment — if so, leave the Instrument Panel off.

If you do leave your Instrument Panel off, you still get the same target information at the bottom of the HUD.



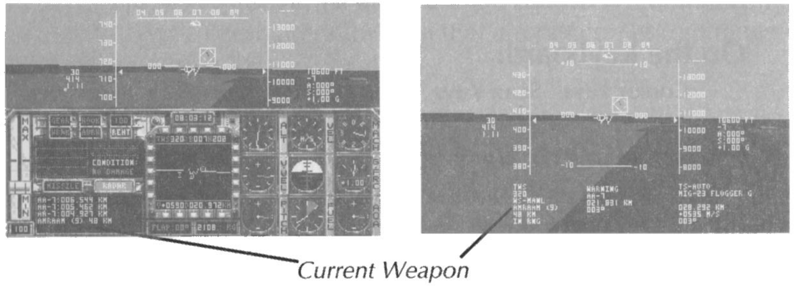
Target Select Auto

Target selection can either be made automatically (TS-AUTO) or manually (TS-MANL). Right now you're in TS-AUTO mode, meaning that your onboard computer is selecting the closest target in front of you. While later you may need to use TS-MANL, you can let the computer choose targets for you for the time being.

Select AMRAAM Missiles

Your radar-guided AMRAAM missiles have a longer locking range (48 km) than your IR-guided ASRAAMs (15 km) or internal gun (10 km), so you should select those as the current weapon. The current weapon is the one that will be fired if you press the fire button.

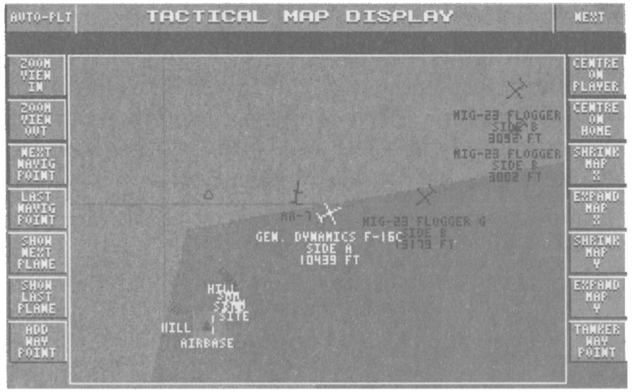
By default, the weapon selection mode is manual (WS-MANL) — this means that you select the current weapon by pressing a key. Press the **left shift** key until AMRAAMs are the current weapon.



Check The Combat Situation

In general, it's a good idea to maintain an "overview" of the tactical situation in your mind. This is what's called "situational awareness" and is acknowledged as a real factor in air combat — the ability to track the complexities of a fast-moving, dynamic combat situation. While you're waiting to close in, press **Return** to bring up the Tactical Map Display.

Experiment with any of the buttons on the side of the display. When you're done, press **Return** to return to the mission.


AUTO-PLT
TACTICAL MAP DISPLAY
NEXT
ZOOM VIEW IN
ZOOM VIEW OUT
NEXT NAVIG POINT
LAST NAVIG POINT
SHOW NEXT PLANE
SHOW LAST PLANE
ADD WAY POINT
CENTRE ON PLAYER
CENTRE ON HOME
SHRINK MAP X
EXPAND MAP X
SHRINK MAP Y
EXPAND MAP Y
TANKER WAY POINT
MIG-23 FLOGGER SIDE B 3092 FT
MIG-23 FLOGGER SIDE B 3002 FT
MIG-23 FLOGGER G SIDE B 13179 FT
AA-7
GEN. DYNAMICS F-16C SIDE A 10439 FT
SITE
HILL
AIRBASE

Wait For Targets To Reach Target Lock Range

If it looks like there's a lot of time before the target comes into locking range, try out some of the view keys. Remember that you can always return to the default point of view by pressing **F10**.

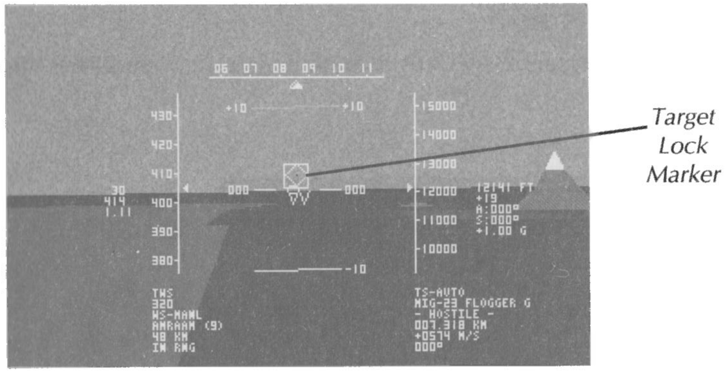
On the Keyboard:

Cursor keys	Scan Keys	**F10**	Default Point Of View

On the numeric Keypad:

Enter	Cockpit ↔ External Toggle	**0 or +**	Zoom In
-	Zoom Out	,	View Last Point Of View
.	View Next Point Of View	1	View Back & Left
2	View Back	3	View Back & Right
4	View Left	5	View Down
6	View Right	7	View Forward & Left
8	View Forward	9	View Forward & Right

Keep an eye on the target to see when it's reached target lock range. When it does, a diamond appears around it.


06 07 08 09 10 11
+10
430
420
410
400
390
380
30
414
1.11
000
-10
15000
14000
13000
12000
11000
10000
12141 FT
+19
A:000°
S:000°
+1.00 G
TWS
320
WS-MAWL
AMRAAM (9)
48 KM
IN RNG
TS-AUTO
MIG-23 FLOGGER G
- HOSTILE -
007.318 KM
+0574 M/S
000°

Target Lock Marker

Fire At Locked On Targets

Once a diamond appears around the target, press the fire button to launch a missile at it. The fire button can be button A on your joystick, the left mouse button, or the **spacebar**.

After you fire, you'll notice that the TS-AUTO computer automatically targets the next closest aircraft. When that aircraft comes into range, fire another AMRAAM missile at it.

Evade Enemy Missiles

As you approach the enemy aircraft, they'll fire missiles at you, too. First you must determine what kind of missile you're facing. Pause the game and turn to the *Soviet Weapons* section in ***Chapter 6: Technical Reference*** to find out whether you're facing a radar- or infrared-guided missile.

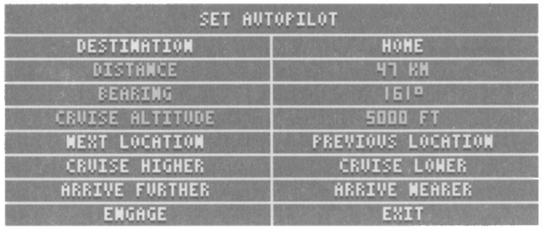
Once you've determined the missile's guidance type, you can take appropriate countermeasures. Press **C** to release a chaff cartridge to distract a radar-guided missile (within 10 km). Press **F** to release a flare to distract an infrared-guided missile (within 6 km).

Destroy The Incoming Enemy Aircraft

Use as many missiles as it takes to destroy the incoming enemy aircraft. Your wingmen will help you out by launching missiles of their own.

Auto-Pilot Home

When you've cleared the skies of enemy aircraft, press **Y** to bring up the Auto-Pilot.



SET AUTOPILOT

DESTINATION	HOME
DISTANCE	47 KM
BEARING	161°
CRUISE ALTITUDE	5000 FT
NEXT LOCATION	PREVIOUS LOCATION
CRUISE HIGHER	CRUISE LOWER
ARRIVE FURTHER	ARRIVE NEARER
ENGAGE	EXIT

The Auto-Pilot lets you "warp" to a pre-selected destination — an airbase, carrier, target, or navigation waypoint. By default, the Auto-Pilot destination is set on your home base — just where you want to go.

Since you'll be landing, you won't want to appear directly over the airbase. Instead, you'll want to arrive a few kilometres out so you can make your approach. Press the **left cursor** key (←) to "Arrive Further" –– about 10 km out. Press the **down** or **up cursor** key (↑↓) to "Cruise Lower" at 1000 ft. Press **Return** to activate the Auto-Pilot.

Once you arrive, you'll need to line up and make a landing. For complete landing instructions, see *Landing* in ***Chapter 4: The Basics Of Flight***.

Chapter 2:

Preflight

Pilot Record

Though there are many pilots serving on both sides of the conflict, you can only play one pilot in any campaign. However, this doesn't limit the types of missions or airplanes you can fly. The same pilot can fly a bombing mission one day, intercept enemy pilots the next, and provide close support later in the week.

Each campaign is a separate game, and you can have as many games as you have disks to store them on.

Creating a New Pilot

Since you can only have one pilot in a campaign, creating a new pilot is equivalent to starting a new game. Both sides begin with new airplanes, airbases, carriers, cities, factories, radar installations and SAM sites. Unless you save the old pilot, his current status will be lost when you create the new pilot.

To create a new pilot:

If you just loaded ***Birds of Prey***, creating a new pilot is simple — type a name and press **Return**.

If you've flown a mission since you loaded the game but you want to start a new game with a new pilot, press **N**. A box appears asking you if you want to create a new pilot — press **Y** to answer yes. When the flashing cursor appears, type a name and press **Return**.

Alternately, you can make a new pilot using the **Make New Pilot** option in the Pilot Menus. See **Pilot Menus** below.

Loading & Saving Pilots

Loading and saving pilots may differ between machines. For details on loading and saving pilots with your computer, see the Command Summary Card.

Editing a Pilot Name

You can edit the name of any pilot regardless of whether you've just created or loaded him.

To edit a pilot name:

Press **E**. When the flashing cursor appears, type a new name and press **Return**.

Click on the pilot's name. When the flashing cursor appears, type a new name and press **Return**.

Changing Terrain Types

You can choose to fly over green fields, desert, or arctic terrains.

To cycle through the terrains:

Left-click on **Terrain**.

Press **T**.

Alternately, you can change terrains using options from the Pilot Menus. See *Pilot Menus* below.

Changing Difficulty Levels

Difficulty levels affect the number and type of aircraft you face as well as number of aircraft you can lose before being removed from the front lines. There are four difficulty levels:

Rookie — Up to four lost aircraft allowed.

Pilot — Up to three lost aircraft allowed.

Squadron Leader — Up to two lost aircraft allowed.

Wing Commander — Only one lost aircraft allowed.

To cycle through the difficulty levels:

Left-click on **Difficulty Level**.

Press **D**.

Alternately, you can set the difficulty level using options from the Pilot Menus. See "Pilot Menus" below.

Adding Wingmen

In certain missions, you can fly with wingmen. Wingmen will stay with your aircraft but act independently if engaged with enemy aircraft.

To toggle wingmen on and off:

Left-click on **Wingmen**.

Press **W**.

The number of wingmen you get (or whether you get them at all) depends on the mission you're flying.

Starting Time

You can begin your mission at any time — day or night. When you begin the mission, the sun will be in the correct position for the chosen time. All lighting on objects are reckoned from the sun's current position.

To change the mission starting time:

Point to the hour or minute number and hold down the **left** mouse button. The numbers roll as long as you hold down the mouse button. When you see the number you want, release the mouse button.

Press **0** to increase hours.

Press **9** to decrease hours.

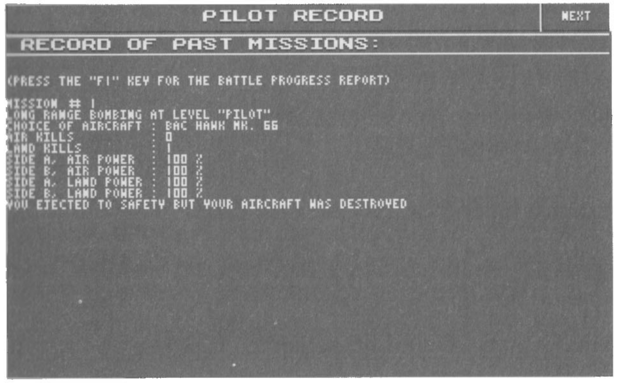
Press the **equal** (=) key to increase minutes.

Press the **minus** (-) key to decrease minutes.

Alternately, you can set the start time using options from the Pilot Menus. See "Pilot Menus" below.

Reviewing Mission Record

You can review a brief record of every mission flown by the pilot currently displayed. For each mission, the record states the type of mission and aircraft flown, the number of air and land kills made by the pilot, and the percentage of air and land power for both sides at the end of each mission. Your airplane's condition and any promotions you may have received are also recorded.



```
(PRESS THE "F1" KEY FOR THE BATTLE PROGRESS REPORT)

MISSION # 1
LONG RANGE BOMBING AT LEVEL "PILOT"
CHOICE OF AIRCRAFT : BAC HAWK MK. 66
AIR KILLS          : 0
LAND KILLS         : 1
SIDE A, AIR POWER  : 100 %
SIDE B, AIR POWER  : 100 %
SIDE A, LAND POWER : 100 %
SIDE B, LAND POWER : 100 %
YOU EJECTED TO SAFETY BUT YOUR AIRCRAFT WAS DESTROYED
```

To review the Mission Record:

Point to Record Of Past Missions and hold down the left mouse button. Move the mouse up to drag the window into view. Reverse this procedure to hide the window.

To scroll through the missions:

Press the **cursor up** (↑) or **cursor down** (↓) key.

Battle Progress Report

As friendly and enemy forces fly missions against each other, the status of the campaign changes. Planes are shot down, radar installations and SAM sites are knocked out, and airbases are destroyed. Replenishing lost equipment and repairing damaged locations demand the time and resources of factories and cities. You can see the status of the campaign anytime you're at the Pilot Record screen.

To see the Battle Progress Report:

Press **F1**.

Four graphs display the loss or development of air and land power for Side A and Side B.

Press the **comma** (,) or **period** (.) key to scroll through the four graphs. Use the **cursor left** (←) and **cursor right** (→) to scroll the graph left and right; use the **cursor up** (↑) and **cursor down** (↓) keys to scale the x axis. When you're done looking at the graphs, press **Return**.

Alternately, you can bring up the Battle Progress Report from the Pilot Menus. See "Pilot Menus" below.

Graphic Detail Selector

The Graphic Detail Selector lets you set the amount of detail the game displays during the mission.

To bring up the Graphic Detail Selector:

Press **G**.

Alternately, you can bring up the Graphic Detail Selector from the Pilot Menus. See "Pilot Menus" below.

Depending on the computer you own, fewer graphic details may make your airplane's flight appear smoother. By default, the game displays maximum detail, so you may want to turn off some of the features to increase the apparent speed of the game.

To change a setting on the Graphic Detail Selector:

Point to the setting and click the left mouse button.

Dots On/Off

When On, dots are displayed on the ground and sea to provide perspective and help you visually estimate altitude.

Fields On/Off

When On, crop patterns are displayed on the ground.

Carriers Simple/Full

When Simple, aircraft carriers are displayed with a minimal number of polygons; when Full, more polygons are used to create the carrier's shape.

Dithering On/Off

When On, dithered patterns are used on some sides of the polygons to create more realistic shapes.

Weapons Visible/Invisible

When Visible, external weapons on aircraft (such as missiles and bombs) are displayed. When Invisible, these weapons are hidden.

Bases Full/Simple

When Full, the paved area around runways and the white runway lines are visible. When Simple, the paved area and runway lines are invisible. In both cases, you can see all other objects on the base: radar, hangar, runway, and air control tower.

Coasts On/Off

When On, the sea is visible. When Off, both sea and land appear green.

(Small) On/Off

When On, only coasts in the immediate vicinity of your aircraft are visible — the seas around this immediate vicinity appear green. Note: When (Small) is On, (Medium) is turned Off; when Coasts are Off, (Small) has no effect.

(Medium) On/Off

When On, only coasts in the general vicinity of your aircraft are visible — the seas around this area appear green. Note: When (Medium) is On, (Small) is turned Off; when Coasts are Off, (Medium) has no effect.

Roads On/Off

When On, roads appear on the ground.

Trees On/Off

When On, you can see trees on the ground when flying at low altitudes.

Hills On/Off

When On, the landscape is dotted with hills and mountains.

Low

When the graphic detail is set on Low, all features except Coasts and Hills are turned *off*.

Medium

When the graphic detail is set on Medium, all features except Weapons and Roads are turned *on*.

High

When the graphic detail is set on High, all features are turned *on*.

Landing Easy

When the graphic detail is set on Landing Easy, Bases are Simple and Hills are turned Off. This optimises the frame rate for landings — flight appears smoother as you're approaching the runway.

Exit

Select Exit to accept the settings and close the Graphic Detail Selector.

Pilot Menus

The Pilot Menus offer alternate ways to configure Birds of Prey, load and save pilots, and quit the game.

To choose options from the Pilot Menus:

Point to the Pilot Record bar at the top of the screen and hold down the right mouse button. When the Pilot Menu bar appears, move the mouse side-to-side to open a menu and up or down to highlight an option. Release the mouse button to select the highlighted option.

Next Option

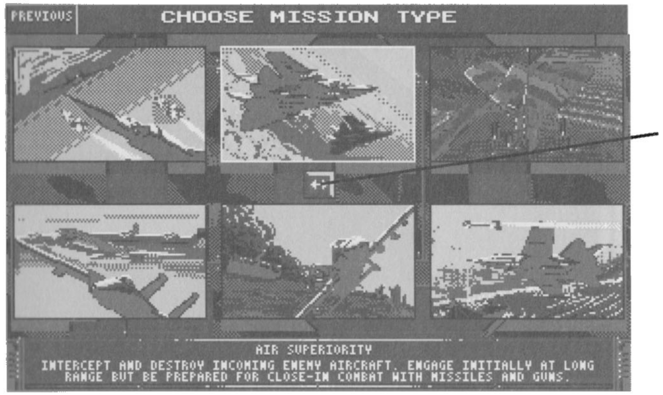
To go to the Choose Mission Type screen:

Left-click on **Next** (missions 1-6 appear).

Press the **spacebar** (1-6 appear).

Press **Return** (missions 7-12 appear).

Choose Mission Type



AIR SUPERIORITY

INTERCEPT AND DESTROY INCOMING ENEMY AIRCRAFT. ENGAGE INITIALLY AT LONG RANGE BUT BE PREPARED FOR CLOSE-IN COMBAT WITH MISSILES AND GUNS.

Click to see more missions

Choosing Your Mission

To read a mission description:

To read a description of a mission, move the mouse cursor to one of the mission pictures. The mission description appears in the text bar below. There are two screens with missions — click on the ↔ button to see the other screen.

To choose a mission:

Point to the mission you wish to fly and click the **left** mouse button. After a moment, the Choose Home Base screen appears.

Once you're familiar with the missions in the game, you can quickly select your mission using the keyboard.

Press any of the following keys to select a mission:

1	Air Interception
2	Air Superiority
3	Long Range Bombing
4	Bomber Escort
5	Close Support And Ground Attack
6	Border Or Sea Patrol
7	Reconnaissance
8	Troop Drop
9	Supply Drop
0	Stealth Bombing
-	Stealth Reconnaissance
=	Test Pilot

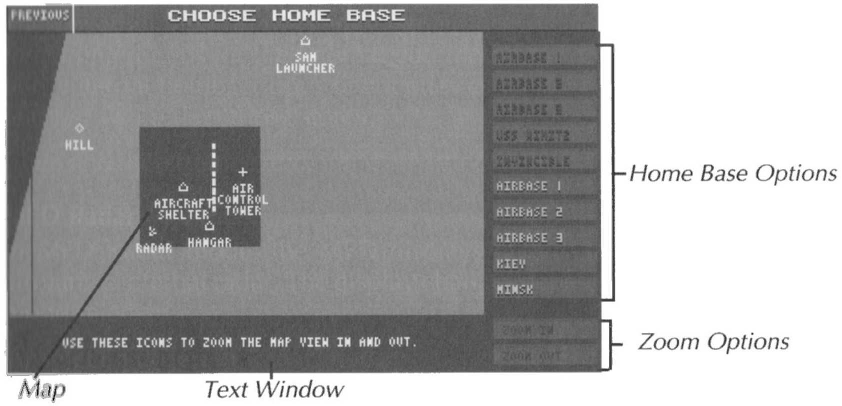
Previous Option

To go back to the Pilot screen:

Left-click on **Previous**.

Press **Esc**.

Choose Home Base


PREVIOUS
CHOOSE HOME BASE
SAM LAUNCHER
HILL
AIRCRAFT SHELTER
AIR CONTROL TOWER
RADAR
HANGAR
AIRBASE 1
AIRBASE 2
AIRBASE 3
USS NIMITZ
INVINCIBLE
AIRBASE 1
AIRBASE 2
AIRBASE 3
KIEV
MINSK
ZOOM IN
ZOOM OUT
Home Base Options
Zoom Options
Map
Text Window

USE THESE ICONS TO ZOOM THE MAP VIEW IN AND OUT.

Using The Map

You can scroll to any part of the map and zoom in and out. At the higher magnifications, objects on the map (hangars, radar stations, hills, aircraft carriers, etc.) are named.

To scroll to any part of the map:

Point to any place on the map and click the left mouse button.

The map will centre on the area under the pointer. You can also scroll the map to an airbase or aircraft carrier by right-clicking on any airbase or carrier button on the right side of the screen.

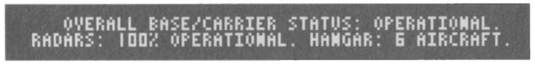
To zoom in and out on an area:

Left-click on either Zoom button.

Checking Base Status

Just as you direct bombing missions against enemy airbases, the enemy will target your bases for attack. Successful attacks result in damage on an airbase's radar and hangar facilities — enough damage and the airbase will be temporarily knocked out.

The base status tells you to what degree the base is operational. You can only check the status of friendly bases — if you want to find out the status of an enemy airbase, you'll have to fly a reconnaissance mission! (If you haven't chosen a side yet for this pilot, you're basically starting a new game, so hangars are full and all bases and radar stations are 100% operational.)



```
OVERALL BASE/CARRIER STATUS: OPERATIONAL.
RADARS: 100% OPERATIONAL. HANGAR: 6 AIRCRAFT.
```

To check the status of a base:

Point to the name of any airbase or aircraft carrier in the Home Base list on the right side of the screen. The base status appears in the Text Window.

The Significance Of Base Status

Each airbase begins with a hangar, aircraft shelter, radar installation, and air control tower. In order for a base to be *operational*, it must have at least a tower, hangar, and runway. If any of these vital targets are destroyed in an enemy attack, the base must be repaired before further missions can be flown from it. The more vital targets that are destroyed, the longer the base will be *under repair*.

If the base's radar installation is destroyed, it's effectively blind. It won't scramble aircraft unless enemy aircraft are within visual distance — which is often too late.

The base also has a protective shelter in which aircraft are stored. If the shelter is destroyed in an enemy attack, any non-airborne aircraft are destroyed with it. The number of aircraft on a base determines the number it can deploy on any mission, offensive or defensive.

Selecting Your Home Base

When you select a home base, you're choosing two things:

- The side the pilot belongs to — Side A or Side B.
- The base you'll fly the current mission from.

You cannot select a base that's currently under repair as your home base. Note: Choosing an aircraft carrier as your home base restricts the type of aircraft you can fly.

To select a home base:

Left-click on any of the Home Base options.

Press any of the following keys:

1	Airbase 1, Side A	**F1**	Airbase 1, Side B
2	Airbase 2, Side A	**F2**	Airbase 2, Side B
3	Airbase 3, Side A	**F3**	Airbase 3, Side B
N	U.S.S. Nimitz	**K**	Kiev
I	H.M.S. Invincible	**M**	Minsk

Alternately, if you're satisfied with your current Home Base, you can simply press the **spacebar** to go to the Aircraft Selection screen.

Previous Option

To go back to the Choose Mission Type screen:

Left-click on **Previous**.

Press **Esc**.

Choose an Aircraft

Any aircraft is designed to fulfil a limited number of roles. Even *multi-role* aircraft — highly versatile jets that can act effectively as fighters, interceptors, and ground attack aircraft — may be useless for saturation bombing, reconnaissance, and other missions. Selecting your aircraft, then, is a matter of choosing the right aircraft for the job.

To review the aircraft:

Select an aircraft from the Aircraft Menus. (See *Aircraft Menus* below.)

Press the **period** (.) key for the next aircraft or the **comma** (,) key for the previous aircraft.

To select the currently displayed aircraft:

Left-click on the **Next** option.

Press the **spacebar**.

You can choose any aircraft that appears on the screen, regardless of whether it's appropriate to the mission or not. If you are unsure which aircraft are appropriate to your mission, you can use the Aircraft Menu options to limit your choice of aircraft to those that are suitable to the current mission.

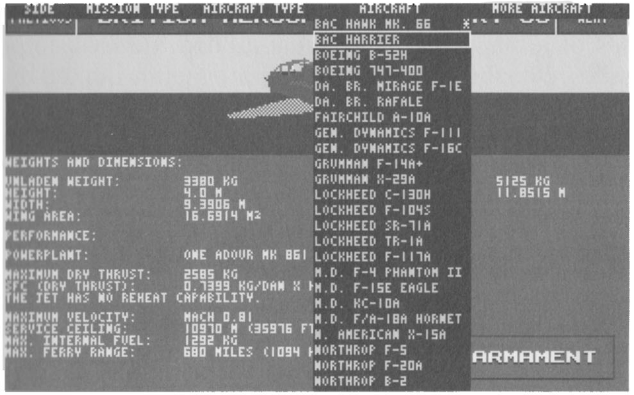
Aircraft Menus

Forty aircraft are simulated in ***Birds of Prey***. Though this offers the widest variety of air combat missions to fly, it can make selecting an aircraft difficult for all but the most knowledgeable about modern military hardware. The Aircraft Menus help you select the right aircraft for your mission by letting you *limit* your choice.

Using the menus, you can specify exactly what kind of aircraft you want to fly. For example, you could reduce the number of aircraft to "those with single jet engines and supersonic capability that can fulfil the air superiority role."

To choose an option from the Aircraft Menus:

Move the mouse pointer up to the top of the screen. Press and hold down the right mouse button. The Aircraft Menus appear. Move the mouse side-to-side to open a menu and up or down to highlight an option. Release the mouse button to select the highlighted option.


SIDE
MISSION TYPE
AIRCRAFT TYPE
AIRCRAFT
MORE AIRCRAFT
BAC HAWK MK. 66
BAC HARRIER
BOEING B-52H
BOEING 747-400
DA. BR. MIRAGE F-1E
DA. BR. RAFALE
FAIRCHILD A-10A
GEN. DYNAMICS F-111
GEN. DYNAMICS F-16C
GRUMMAN F-14A+
GRUMMAN X-29A
LOCKHEED C-130H
LOCKHEED F-104S
LOCKHEED SR-71A
LOCKHEED TR-1A
LOCKHEED F-117A
M.D. F-4 PHANTOM II
M.D. F-15E EAGLE
M.D. KC-10A
M.D. F/A-18A HORNET
N. AMERICAN X-15A
NORTHROP F-5
NORTHROP F-20A
NORTHROP B-2
ARMAMENT

```
EIGHTS AND DIMENSIONS:
NLADEN WEIGHT:          3380 KG                5125 KG
EIGHT:                  4.0 M                  11.8515 M
IDTH:                   9.3906 M
ING AREA:               16.6914 M²
ERFORMANCE:
OWERPLANT:              ONE ADOUR MK 861
AXIMUM DRY THRUST:      2585 KG
FC (DRY THRUST):        0.7399 KG/DAN X
HE JET HAS NO REHEAT CAPABILITY.
AXIMUM VELOCITY:        MACH 0.81
ERVICE CEILING:         10970 M (35976 FT
AX. INTERNAL FUEL:      1292 KG
AX. FERRY RANGE:        680 MILES (1094
```

Side Menu

When the Aircraft Selection screen appears, you can only review descriptions and specifications for aircraft on your side. However, if you want to review enemy aircraft as well, select the enemy's side or select Both. Note: Although these options allow you to review enemy aircraft, you can only *fly* aircraft from your side.

Mission Type Menu

Options on the Mission Type Menu help you choose an aircraft that's appropriate to the mission you're about to fly. Which aircraft are displayed — Side A, Side B, or both — depends on the option currently selected in the Side Menu.

Aircraft Type Menu

Options on the Aircraft Type Menu let you specify exactly what kind of aircraft you want to fly. Which aircraft are displayed — Side A, Side B, or both — depends on the option currently selected in the Side Menu.

Aircraft Menu(s)

The Aircraft Menu contains the aircraft you can choose from. The list of aircraft will be longer or shorter depending on the options you chose in the other menus. If the list of aircraft is too long for the Aircraft Menu, a second menu — More Aircraft — appears in the menu bar.

Armament

Each aircraft is limited by the armaments it can carry. Some are limited by the *types* of armaments (guns, radar-guided missiles, infrared guided missiles, etc.) they can carry; others are merely limited by the armament *models* (AA-2, AA-4, etc.).

To switch between armament and aircraft descriptions:

Left-click on the **Armament/Aircraft** button.

Press **A** or **Return**.

Next Option

To go to the next screen:

Left-click on **Next**.

Press the **spacebar**.

Previous Option

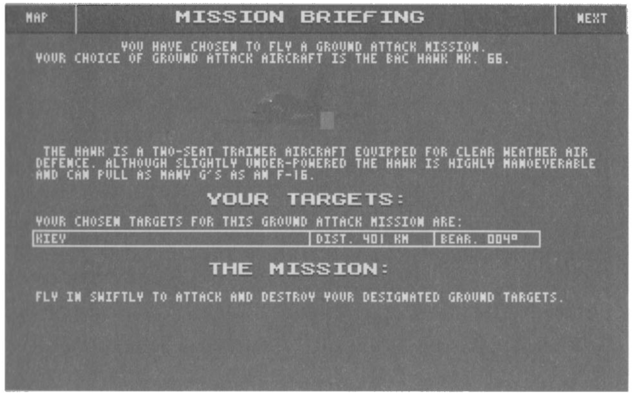
To go back to the Choose Home Base screen:

Left-click on **Previous**.

Press **Esc**.

Mission Briefing

Once you've gone to Mission Briefing, you've committed yourself to flying the mission. You're given a summary of your mission and the location of your target(s).



YOU HAVE CHOSEN TO FLY A GROUND ATTACK MISSION.
YOUR CHOICE OF GROUND ATTACK AIRCRAFT IS THE BAC HAWK MK. 66.

THE HAWK IS A TWO-SEAT TRAINER AIRCRAFT EQUIPPED FOR CLEAR WEATHER AIR DEFENCE. ALTHOUGH SLIGHTLY UNDER-POWERED THE HAWK IS HIGHLY MANOEVERABLE AND CAN PULL AS MANY G'S AS AN F-16.

YOUR TARGETS:

YOUR CHOSEN TARGETS FOR THIS GROUND ATTACK MISSION ARE:

KIEV	DIST. 401 KM	BEAR. 004°

THE MISSION:

FLY IN SWIFTLY TO ATTACK AND DESTROY YOUR DESIGNATED GROUND TARGETS.

You may not go back and change your home base, aircraft, etc., though you can abort the mission once it's started and simply reselect these (see "Aborting the Mission" under *Game Controls* in Section 3).

Once you've read the mission briefing, you can bring up the Tactical Map Display, proceed to the Refuel and Load Weapons screen, or skip the Refuel and Load Weapons screen and begin your mission.

Map Option

To go to the Tactical Map Display:

Left-click on the **Map** button.

For details on the Tactical Map Display, see "Tactical Map Display" under *AWACS Information* in ***Section 3: Flight controls***. When you're done looking at the display, press **Return**.

Next Option

To go to the Refuel and Load Weapons screen:

Left-click on the **Next** button.

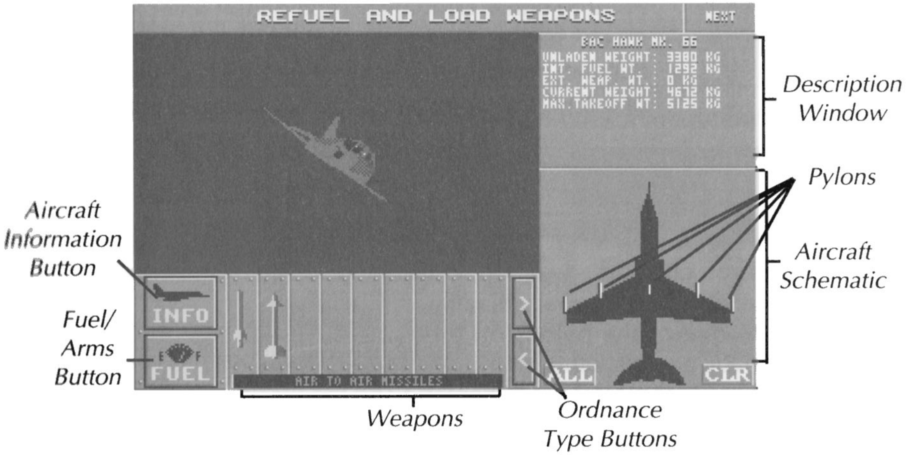
Press the **spacebar**.

You may not need to refuel or arm reconnaissance or transport aircraft. When undertaking a reconnaissance, troop drop or supply drop mission, you can simply bypass the Refuel and Load Weapons screen and go straight to the cockpit.

Right-click on the **Next** button.

Press **Return**.

Refuel and Load Weapons



BAC HAWK MK. 66
UNLADEN WEIGHT: 3380 KG
INT. FUEL WT. : 1292 KG
EXT. WEAP. WT.: 0 KG
CURRENT WEIGHT: 4672 KG
MAX.TAKEOFF WT: 5125 KG

REFUEL AND LOAD WEAPONS
NEXT
INFO
FUEL
AIR TO AIR MISSILES
ALL
CLR
Description Window
Pylons
Aircraft Schematic
Aircraft Information Button
Fuel/ Arms Button
Weapons
Ordnance Type Buttons

Selecting Ordnance Types

Different aircraft can carry different types of ordnance. There are five weapon types:

- Air-To-Air Missiles
- Air-To-Surface Missiles
- Guided And Unguided Bombs
- Miscellaneous Ordnance
- Internal Bomb Load

The type of ordnance your aircraft can carry is a question of design. Military aircraft are first and foremost *weapon platforms*, and their design is partially dictated by the type of weapon they're intended to deliver.

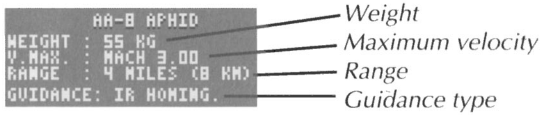
To see the types of weapons your aircraft is capable of carrying:

Click on the > and < buttons.

Loading Weapons To Pylons

To load a weapon:

Point to either Ordnance Type button and click a mouse button. When the Ordnance Type you want appears, point to a weapon and click. A description of the weapon appears in the Description window:



```
        AA-8 APHID
WEIGHT : 55 KG
V.MAX. : MACH 3.00
RANGE  : 4 MILES (8 KM)
GUIDANCE: IR HOMING.
```

When you click on a weapon, your mouse cursor turns into a small missile icon. To arm your aircraft with that weapon, move the missile icon to one of the pylons on the wing or fuselage of the Aircraft Schematic and click the left mouse button. Alternately, you can click anywhere in the Airplane Schematic and the weapon will be loaded onto the next available pylon. If you want to load a single weapon onto *every* available pylon, click on the weapon and then click ALL.

To remove a weapon:

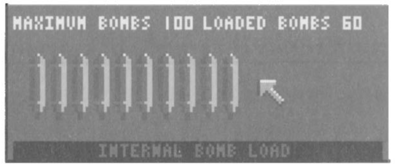
Right-click on any pylon. If you want to remove *all* of the weapons from your aircraft, click **CLR**.

Loading Internal Bombs

Bombers are capable of carrying internal bomb loads. The internal bay is empty until you fill it.

To load internal bombs:

Point to either Ordnance Type button and click a mouse button until internal bomb gauge appears.



```
MAXIMUM BOMBS 100 LOADED BOMBS 60
INTERNAL BOMB LOAD
```

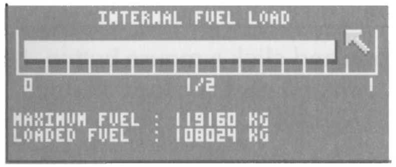
Point to gauge. Hold down the right mouse button to load bombs; hold down the left mouse button to unload bombs.

Refuelling

Your internal fuel tank is automatically filled to maximum capacity, but if you want to sacrifice fuel for a heavier weapon load, you can decrease the amount of fuel you're carrying.

To adjust the internal fuel load:

Point to the **Fuel** icon and click a mouse button. The Fuel icon changes to "Arms" and the internal fuel load gauge appears:



```
      INTERNAL FUEL LOAD
0            1/2            1
MAXIMUM FUEL  : 119160 KG
LOADED FUEL   : 108024 KG
```

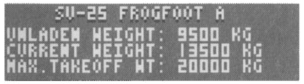
Point to internal fuel load gauge. Hold down the left mouse button to decrease fuel; hold down the right mouse button to increase. When you want to go back to weapon selection, click on the **Arms** icon.

External Fuel Tanks

Many aircraft can be equipped with external fuel tanks capable of carrying additional fuel. External fuel tanks can be found among the Miscellaneous Ordnance and loaded to pylons in the same way that weapons are loaded.

Monitoring Weight

Your aircraft has a maximum takeoff weight which cannot be exceeded if you want maximum performance. Use the Description Window to monitor your aircraft's current weight.



```
     SU-25 FROGFOOT A
UNLADEN WEIGHT: 9500 KG
CURRENT WEIGHT: 13500 KG
MAX.TAKEOFF WT: 20000 KG
```

Bear in mind that you don't necessarily have to start your mission with a full fuel load. In-flight refuelling technology means you can start off with a heavy weapon load and refuel before heading home. For details on mid-air refuelling, see *Mid-Air Refuelling* in ***Section 5: Mission Tactics***.

Information

Before you begin your mission, you may want to review your airplane's performance stats or those of the currently selected ordnance.

To review your airplane's performance stats:

Point to the Aircraft Schematic and click a mouse button — this turns your cursor back to an arrow (if it isn't already). Now point to the Info icon and click a mouse button.

To review the stats for a weapon:

Point to the weapon and click a mouse button. Now point to the Info icon and click a mouse button.

Next Option

To start the mission:

Left-click on the **Next** button.

Press the **spacebar**.

Chapter 3:

Flight Controls

Game Controls

Pausing The Game

To pause the game, press the **backspace** key (←). Press it again to resume the mission.

Aborting The Mission

To abort a mission, you must first land your aircraft. Once it's on the ground, press **Esc**.

Note: If your aircraft is still in the air, pressing **Esc** ejects you from the aircraft. Ejecting from an aircraft counts as an aircraft lost. Once you've ejected, you can press **Esc** again to end the mission.

Quitting The Game

To quit ***Birds Of Prey***, select the **Workbench** option from the Game Menu. For details on bringing up the Pilot Menus, see *Pilot Menus* in this section.

Head-Up-Display (HUD)

The *Head-Up-Display* (HUD) is a transparent sheet spread across the glareshield which projects important flight and weapons information. Since air combat is a fast-paced and dynamic environment, you need to be aware of the situation at all moments. The HUD provides you with the most crucial information without forcing you to take your eyes from a quickly-changing combat environment.

To turn the HUD off and on:

Press **D**.

The HUD With The Instrument Panel Off

When you start the mission, the Instrument Panel is displayed. You can turn the Instrument Panel off to give you a wider view of the combat situation.

To turn the Instrument Panel off and on:

Press **W**.

When the Instrument Panel is on, the HUD only projects flight information. When the Instrument Panel off, the HUD also displays information on weapons, targets and incoming missiles.

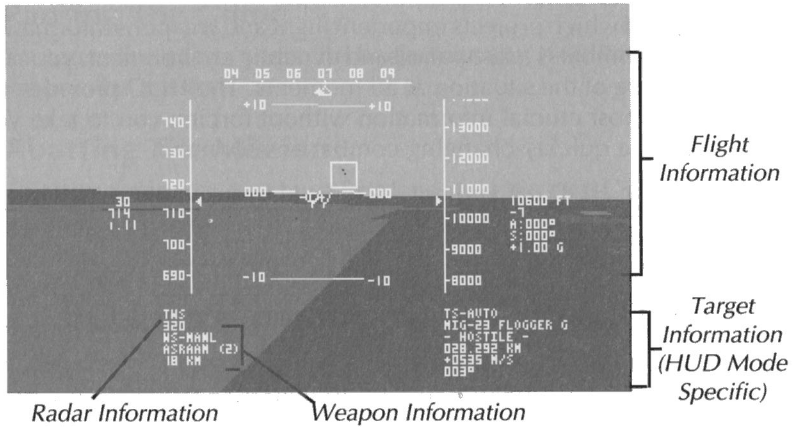
Universal HUD Information

There are four HUD modes: Radar, Navigation, Bomb-Aimer, and Landing.

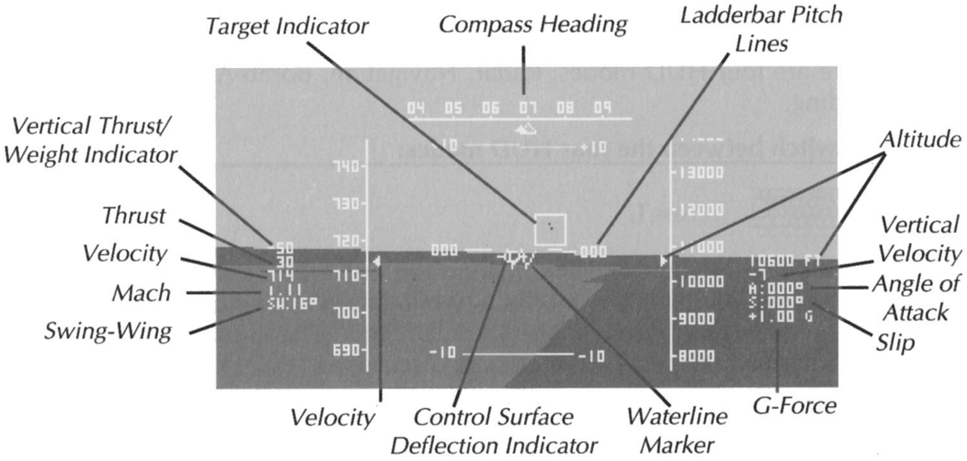
To switch between the four HUD modes:

Press **I**.

Some HUD symbols and information are universal — they're the same across all four HUD modes — while others appear only when a particular mode is active. The four HUD modes, and the symbols and information specific to them, are discussed in the sections that follow.


Flight Information
Target Information (HUD Mode Specific)
Radar Information
Weapon Information
TWS
320
WS-MANL
ASRAAM (2)
18 KM
TS-AUTO
MIG-23 FLOGGER G
- HOSTILE -
028 292 KM
+0535 M/S
003°
10600 FT

Flight Information


Target Indicator
Compass Heading
Ladderbar Pitch Lines
Vertical Thrust/ Weight Indicator
Thrust
Velocity
Mach
Swing-Wing
Altitude
Vertical Velocity
Angle of Attack
Slip
Velocity
Control Surface Deflection Indicator
Waterline Marker
G-Force

Altitude
Your altitude above sea level in feet or metres, depending on the current setting in the Game Menu — see the **HUD Metric** option under **Game Menu** in *Flight Menus.* All flat ground in ***Birds of Prey***, including airport runways, is at sea level (0 feet).

Angle of Attack
The angle at which your wings meet the airflow. For details on the effect of angle of attack on your airplane, see ***Chapter 4: Basic Aerodynamics.***

Compass Heading
The direction your airplane is flying relative to the compass. The compass is divided into 360 degrees — north is 0°, east is 90°, south is 180°, and west is 270°. Use the heading to determine which direction you're flying. For example, if your compass heading is 316°, you know that you're flying in a northwesterly direction.

Control Surface Deflection Indicator
Indicates the direction toward which the airplane is rolling, climbing, or descending.

G-Force
The number of g's you and your airplane are experiencing. The g is the basic unit of load factors on your airplane and is often used to measure the severity of a turn.

Mach
The ratio of airspeed to the speed of sound. Mach 1 is 760 miles per hour at sea level.

Ladderbar Pitch Lines
The angle of your airplane in relation to the horizon. Even if you can't see the horizon, the pitch lines tell you how you're flying in relation to it. In level flight, your pitch is 00°. If your airplane were flying straight up (at a right angle to the earth), your pitch would be +90°; straight down and your pitch would be -90°.

Slip
The rate at which the tail is slipping in a turn.

Swing-Wing Angle

Only available on airplanes with swing-wing capability. Indicates the angular degree at which the wing is swept back.

Target Indicators

⇨	Indicates the direction you would need to turn in order to head toward the current target. Note that "target" can mean several things. In Radar and Bomb Aimer HUD modes, a target is an enemy airplane or ground target. In Navigation and Landing HUD modes, a target is a location or waypoint.
△	Indicates that the target is before you — within 35° of the nose of your airplane.
▲	Indicates that you are headed directly for the target.

Throttle Setting

↑100R	Indicates the amount of thrust currently requested, measured as a percentage of total engine output (0-100%). When you change the throttle setting, the engine must increase or decrease thrust to match your request. A small arrow (↑) indicates that the engine is still creating the requested thrust; an inverted arrow indicates that the engine is decreasing thrust to match the throttle setting. An "R" stands for "reheat," indicating that afterburners have been ignited.

Velocity

Your forward velocity measured in knots or metres per second, depending on the setting in the Game Menu — see the **HUD Metric** option under **Game Menu** in *Flight Menus*. One knot equals 1.1508 statute miles per hour or 0.5144 metres per second.

Vertical Velocity

The rate at which you're gaining or losing altitude, measured in feet or metres per second, depending on setting in the Game Menu — see the **HUD Metric** option under **Game Menu** in *Flight Menus*. A positive number means you're gaining altitude, a negative number means you're losing it. Zero indicates level flight.

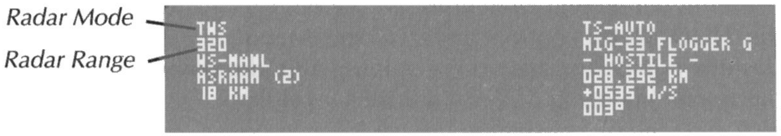
Vertical Thrust/Weight

Only available on airplane's with vertical launch capability. Indicates the percentage of the thrust pushing the airplane up. At 0, your airplane will take off. For details on vertical takeoffs and landings, see ***Chapter 4: Basic Aerodynamics***.

Waterline Marker

W	The waterline marker is a quick visual indication that you're at 000° pitch.

Radar Information

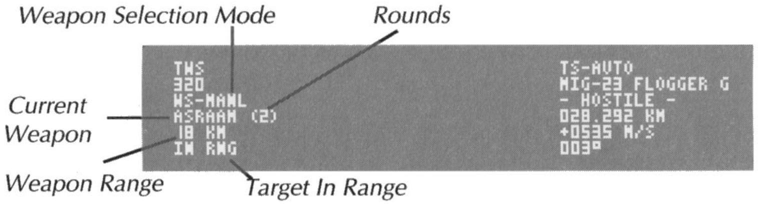

Radar Mode
Radar Range

```
TWS                                TS-AUTO
320                                MIG-23 FLOGGER G
WS-MANL                            - HOSTILE -
ASRAAM (2)                         028.292 KM
 18 KM                             +0535 M/S
                                   003°
```

Radar Mode
Which Radar mode you are currently in. For explanations of the various Radar modes, see *Using Radar.*

Radar Range
Your radar's current range setting in kilometres.

Weapon Information


Weapon Selection Mode
Rounds
Current Weapon
Weapon Range
Target In Range

```
TWS                                TS-AUTO
320                                MIG-23 FLOGGER G
WS-MANL                            - HOSTILE -
ASRAAM (2)                         028.292 KM
18 KM                              +0535 M/S
IN RNG                             003°
```

Weapon Selection Mode
The weapon selection mode is either automatic (WS-AUTO) or manual (WS-MANL). For details on weapon selection modes, see **Weapon Selection** under *Weapon Systems.*

Current Weapon
The weapon you would fire if you pressed the fire button. For details on changing the current weapon, see **Weapon Selection** under *Weapon Systems.*

Rounds
The number of rounds available for the current weapon.

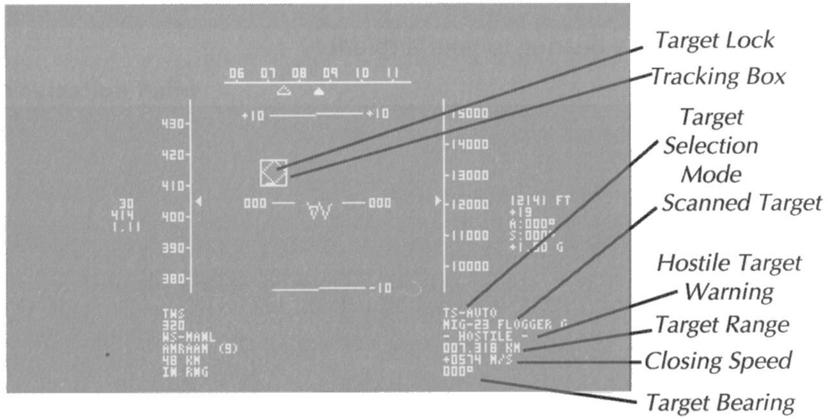
Weapon Range
The maximum lock on range of the current weapon.

Target In Range
Appears when the current target is within lock on range of the current weapon.

The HUD In Radar Mode

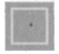
In Radar Mode, the HUD displays information on objects detected by your airplane's onboard radar. What objects your radar picks up depends on which modes is active. There are five modes which affect radar: Track-While-Search (TWS), Range-While-Search (RWS), HUD, Ground-Attack, and Gun-Director. For details on using the five radar modes, see *Using Radar.*

The information presented on the HUD varies slightly among the five modes. Below is the HUD in TWS Radar mode.

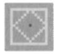

06 07 08 09 10 11
+10
+10
430
420
410
400
390
380
30
414
1.11
000
000
-10
15000
14000
13000
12000
11000
10000
12141 FT
+19
A:000°
S:000°
+1.00 G
Target Lock
Tracking Box
Target Selection Mode
Scanned Target
Hostile Target Warning
Target Range
Closing Speed
Target Bearing

```
TWS                                TS-AUTO
320                                MIG-23 FLOGGER G
WS-MANL                            - HOSTILE -
AMRAAM (9)                         007.318 KM
48 KM                              +0574 M/S
IN RNG                             000°
```

Tracking Box & Target Lock Indicator



Indicates that the target has been acquired and is being tracked by your airplane's computer. The target will continue to be tracked as long as it remains in front of your airplane.



Indicates that the target has been acquired and is in lock on range of the current weapon.

Target Selection Mode

The target selection mode is either automatic (TS-AUTO) or manual (TS-MANL-SELECT/TRACK). For details on target selection modes, see **Target Selection** under *Weapon Systems.*

Scanned Target

The nature of the target. In the case of aircraft, the make and model of the airplane is displayed.

Hostile Target Warning

Appears only when the object belongs to the enemy.

Target Range

The range of the target in kilometres.

Closing Speed

The speed at which you're closing on the target, measured in metres per second. A positive number means you're closing on the target; a negative number means you're increasing distance.

Target Bearing

The target's bearing to your airplane.

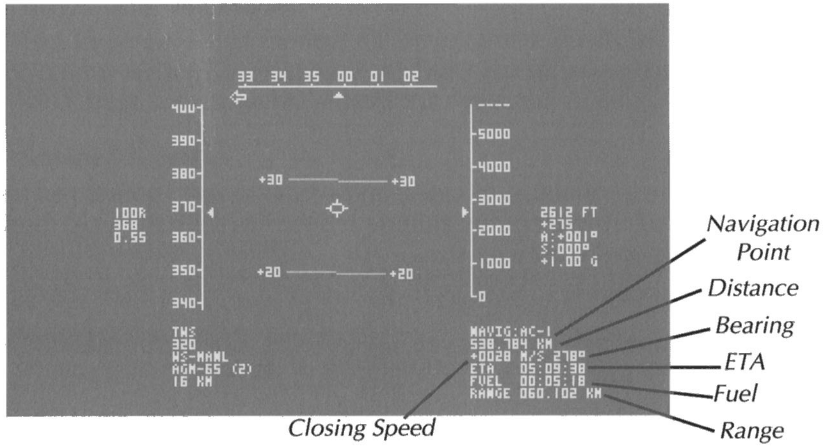
Bearing Vs. Heading

A targeted airplane's bearing is different from it's heading. The target's *heading* is the path it's following in relation to the compass. If the target is heading due south, it's heading will be 180° regardless of how *you* manoeuvre. Only when the *target* turns will its heading change.

The target's *bearing* is where it is relative to your airplane. When you turn, the target's bearing changes. To understand bearing, imagine a circle around your airplane. The nose of your airplane is 0°; your right wing is 90°; your tail is 180°; and your left wing is 270°.

The HUD In Navigation Mode

In Navigation mode, the HUD displays information that helps you navigate toward navigation points — waypoints, airbases, aircraft carriers, and mission targets. For details on the navigation, see *Navigating.*


33 34 35 00 01 02
400
390
380
370
360
350
340
+30
+20
100R
368
0.55
TWS
320
WS-MANL
AGM-65 (2)
16 KM
5000
4000
3000
2000
1000
0
2612 FT
+275
A:+001°
S:000°
+1.00 G
NAVIG:AC-1
538.784 KM
+0028 M/S 278°
ETA 05:09:38
FUEL 00:05:18
RANGE 060.102 KM
Navigation Point
Distance
Bearing
ETA
Fuel
Range
Closing Speed

Navigation Point

The current location toward which you're navigating. Locations are abbreviated as follows:

HOME	Your Home Base
AB-1, AB-2, AB-3	Airbase 1, Airbase 2, Airbase 3
AC-1, AC-2	Aircraft Carrier 1, Aircraft Carrier 2
CS-1, etc.	Close Support Target 1, etc.
GT-1, etc.	Ground Target 1, etc.
RE-1, etc.	Reconnaissance Target 1, etc.
SD-1, etc.	Supply Drop Target 1, etc.
TD-1, etc.	Troop Drop Target 1, etc.
TNKR	Tanker Waypoint
WP-1, WP-2, etc.	Waypoint 1, Waypoint 2, etc.

Distance

Your distance from the current navigation point.

Closing Speed
The speed at which you're closing on the navigation point, measured in metres per second. A positive number means you're closing on the location; a negative number means you're increasing distance.

Bearing
The bearing of the navigation point to your current course.

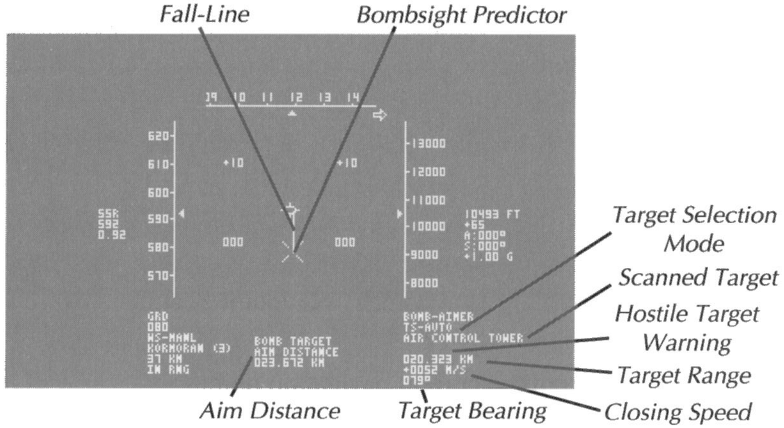
ETA
Estimated time of arrival. The ETA only appears if the navigation point is somewhere in the area 180° forward of your airplane

Fuel
The number of hours, minutes, and seconds worth of fuel you have left, based on your current altitude and throttle setting (that is, the rate at which you're burning it).

Range
The number of kilometres you can travel at your current altitude and throttle setting.

The HUD In Bomb-Aimer Mode

In Bomb-Aimer mode, the HUD displays a targeter that helps you drop bombs accurately. Your radar must be set on Ground Mode (GRD) in order to track ground targets. For details on bombing ground targets, see *Bombing Missions* in ***Chapter 5: Mission Tactics.***


Fall-Line
Bombsight Predictor
19 10 11 12 13 14
620
610
600
590
580
570
+10
+10
000
000
SSR
592
0.92
13000
12000
11000
10000
9000
8000
10493 FT
+65
A:000°
S:000°
+1.00 G
GRD
080
WS-MANL
KORMORAN (3)
37 KM
IN RNG
BOMB TARGET
AIM DISTANCE
023.672 KM
BOMB-AIMER
TS-AUTO
AIR CONTROL TOWER
020.323 KM
+0052 M/S
079°
Target Selection Mode
Scanned Target
Hostile Target Warning
Target Range
Closing Speed
Aim Distance
Target Bearing

Fall-Line
The bomb's descent path based on the airplane's current pitch and roll.

Bombsight Predictor
The predicted point at which the bomb will strike the surface.

Target Selection Mode
The Target Selection mode is either automatic (TS-AUTO) or manual (TS-MANL-SELECT/TRACK). For details on target selection modes, see **Target Selection** under *Weapon Systems.*

Scanned Target
The nature of the target.

Hostile Target Warning
Appears only when the object belongs to the enemy.

Target Range
The range of the target in kilometres.

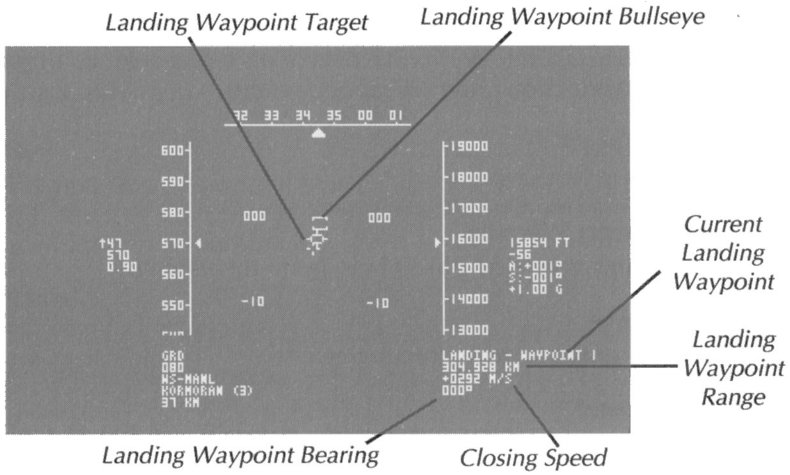
Closing Speed
The speed at which you're closing on the target, measured in metres per second. A positive number means you're closing on the target; a negative number means you're increasing distance.

Target Bearing
The target's bearing to your airplane.

Aim Distance
The distance to the point at which you should release the bomb, based on your airplane's current altitude, velocity, pitch and roll.

The HUD In Landing Mode

In Landing mode, the HUD displays mid-air landing waypoints that help you do a perfect landing. There are three landing waypoints along the glideslope. For details on landing using the Landing HUD mode, see ***Chapter 4: Basic Aerodynamics***.


Landing Waypoint Target
Landing Waypoint Bullseye
Current Landing Waypoint
Landing Waypoint Range
Landing Waypoint Bearing
Closing Speed
32 33 34 35 00 01
600
590
580
570
560
550
↑47
570
0.90
000
000
-10
-10
19000
18000
17000
16000
15000
14000
13000
15854 FT
-56
A:+001°
S:-001°
+1.00 G
GRD
080
WS-MANL
KORMORAN (3)
37 KM
LANDING - WAYPOINT 1
304.928 KM
+0292 M/S
000°

Landing Waypoint Target
The landing waypoint you're aiming for.

Landing Waypoint Bullseye
The nose of your airplane. The idea is to get the bullseye onto the landing waypoint target.

Current Landing Waypoint
The landing waypoint you're aiming for.

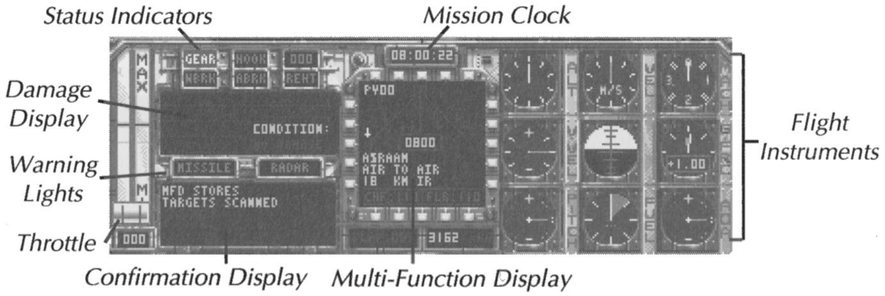
Landing Waypoint Range
The range of the landing waypoint in kilometres.

Closing Speed
The speed at which you're closing on the landing waypoint, measured in metres per second. A positive number means you're closing on the landing waypoint; a negative number means you're increasing distance.

Landing Waypoint Bearing
The landing waypoint's bearing to your airplane.

Instrument Panel

The *Instrument Panel* contains gauges and a cathode ray tube display (CRTs) that measures the performance of your airplane and the status of its major systems.

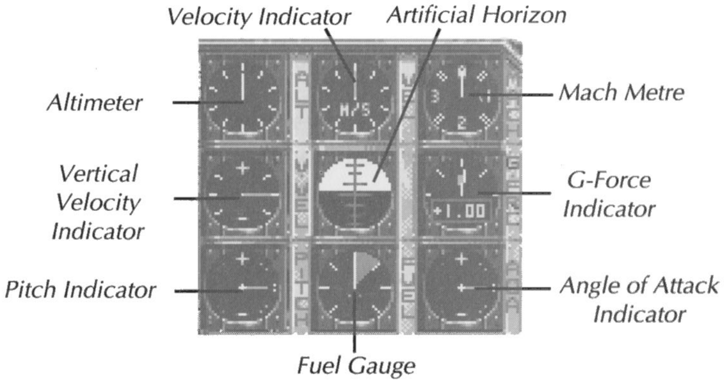

Status Indicators
Mission Clock
Damage Display
Warning Lights
Throttle
Flight Instruments
Confirmation Display
Multi-Function Display

Confirmation Display

Displays messages confirming actions such as raising or lowering landing gear, scanning targets, "auto-centre on", etc.

Flight Instruments

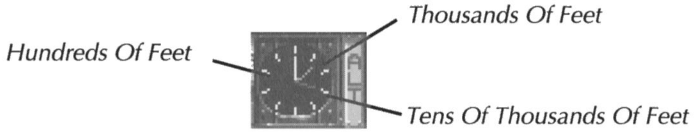
The Flight Instruments provide you with information on the airplane's performance.


Velocity Indicator
Artificial Horizon
Altimeter
Mach Metre
Vertical Velocity Indicator
G-Force Indicator
Pitch Indicator
Angle of Attack Indicator
Fuel Gauge

Altimeter

Measures your altitude above sea level in feet. All flat ground in ***Birds of Prey***, including airport runways, is at sea level (0 feet).

There are three needles on the altimeter. The white needle measures hundreds of feet; the light grey needle, thousands of feet; and the dark grey needle, tens of thousand feet.


Thousands Of Feet
Hundreds Of Feet
Tens Of Thousands Of Feet

Angle of Attack Indicator

The angle at which your wings meet the airflow. For details on the effect of angle of attack on your airplane, see ***Chapter 4: Basic Aerodynamics.***

Artificial Horizon

The angle of your airplane in relation to the horizon.

Fuel Gauge

Indicates the current level of fuel.

G-Force Indicator

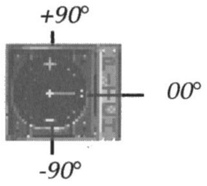
The number of g's you and your airplane are experiencing. The g is the basic unit of load factors on your airplane and is often used to measure the severity of a turn. As long as you maintain a safe g-load, the digital read-out on this instrument remains black. The read-out turns red whenever you subject your self to an unsafe g-load.

Mach Metre

See **Mach** in *Head-Up-Display (HUD).*

Pitch

See **Pitch Lines** in *Head-Up-Display (HUD).*



Velocity Indicator
Your forward velocity, measured in metres per second.

Vertical Velocity Indicator
See **Vertical Velocity** in *Head-Up-Display (HUD).*

Mission Clock

Indicates the time of day in hours, minutes, and seconds.

Multi-Function Display (MFD)

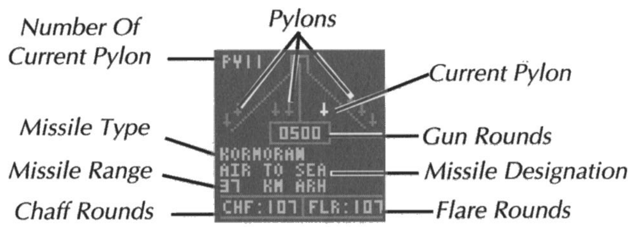
Displays weapon, radar, and navigation information as well as an overhead visual display of environment. The type of information displayed depends on the MFD mode selected.

To switch between the four MFD modes:

Press **M**.

MFD Stores Mode

In MFD Stores mode, the MFD lets you see the number of missiles, bombs, gun pods and external fuel tanks remaining on your airplane and the pylons they occupy. Other stores such as gun rounds, internal bombs, troops, and supplies appear in the box in the centre.


Number Of Current Pylon
Pylons
Current Pylon
Missile Type
Gun Rounds
Missile Range
Missile Designation
Chaff Rounds
Flare Rounds
PYII
0500
KORMORAN
AIR TO SEA
37 KM ARH
CHF:107
FLR:107

The current pylon appears in white; listed below are the designation, type, and range of the weapon on it.

To see what's on a different pylon:

Press **K**.

Note that selecting a different pylon *does not* designate that weapon as the current weapon. It only lets you *view* the weapon on that pylon. External fuel tanks are an exception — if you select an external fuel tank pylon on the MFD Stores display and press the weapon fire button, the fuel tank is released.

The boxed number in the centre generally indicates the number of remaining rounds for the internal gun; however, if you select a gun pod, internal bombs, troops or supplies as the current weapon, this number will reflect those stores.

Chaff and flare rounds remaining are listed at the base of the display.

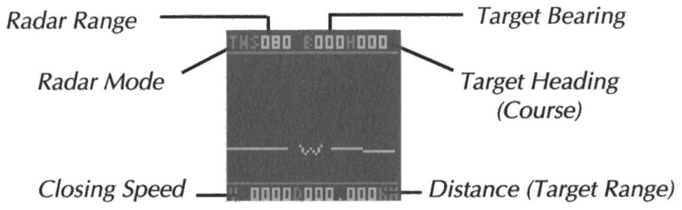
MFD Radar Mode

In MFD Radar mode, the MFD displays targets scanned by your airplane's internal radar. The display changes depending on the radar mode selected.

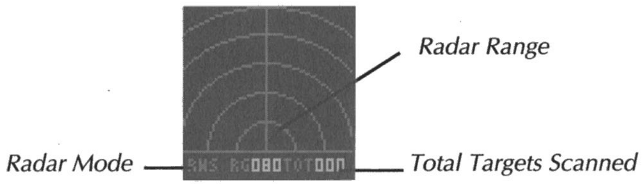
To select a different Radar mode:

Press **N**.

In Track-While-Scan (TWS), HUD, and Gun-Director radar modes, the MFD only provides information on the currently selected target. The currently selected target is marked with a box; all other targets are marked with circles.


Radar Range
Target Bearing
Radar Mode
Target Heading (Course)
Closing Speed
Distance (Target Range)
TWS080 B000H000
0000 000.000

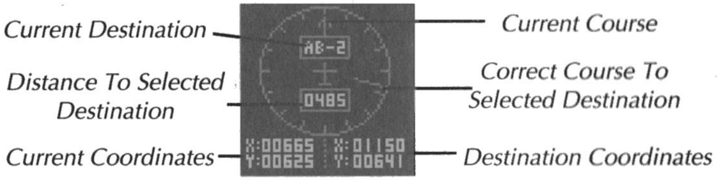
In Range-While-Scan (RWS) and Ground Attack radar modes, the MFD displays.


Radar Range
Radar Mode
Total Targets Scanned
RWS RG080TOT00

For more details on the five Radar modes and their uses, see *Using Radar.*

MFD Navigation Mode

In MFD Navigation mode, the MFD displays the airplane's onboard navigation aid.


Current Destination
Distance To Selected Destination
Current Coordinates
Current Course
Correct Course To Selected Destination
Destination Coordinates
AB-2
0485
X:00665 Y:00625
X:01150 Y:00641

The current destination appears in the box at the top of the MFD.

To select a different destination:

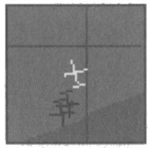
Press **N**.

Your airplane's current heading is represented by the arrow at the top of the compass. The needle points to the heading you would have to follow to arrive at the current destination. Turn your airplane until the needle is pointing to the top of the MFD and you're on the right course.

The two sets of coordinates at the base of your display indicate your current coordinates and the coordinates of your destination. The coordinates are based on a cartesian plotting of the world map, where 0,0 is in the bottom left corner.

MFD Map Mode

In MFD Map mode, the MFD displays an overhead map of the airplane's environment. Your airplane is always shown in the centre of the map display.



Airplane. NATO airplanes appear in white. Soviet airplanes appear in black.

Missile. NATO missiles appear in white. Soviet missiles appear in black.

City, factory, airbase, SAM site, or radar installation. Zoom in to find out what a particular triangle indicates.

Aircraft carrier.

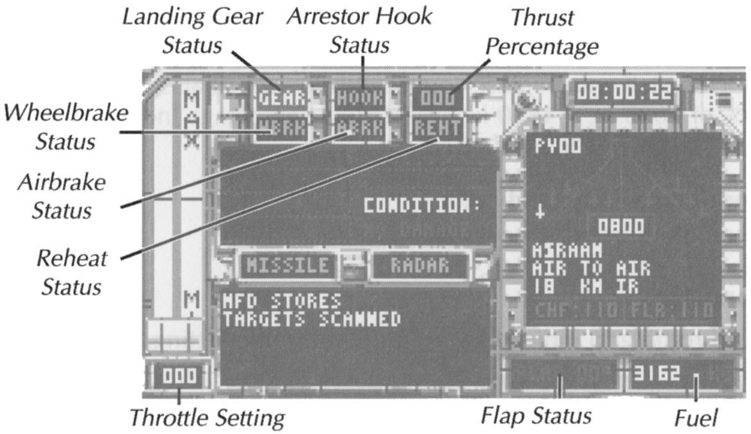
Hill.

You can zoom in and out on the map — there are 12 levels of magnification.

To zoom in and out on the map:

Press the **hash mark** (**#**) key to increase magnification; press the **semi-colon** (**;**) key to decrease magnification.

Status Indicators


Landing Gear Status
Arrestor Hook Status
Thrust Percentage
Wheelbrake Status
Airbrake Status
Reheat Status
Throttle Setting
Flap Status
Fuel
MAX
GEAR
HOOK
000
WBRK
ABRK
REHT
08:00:22
PY00
CONDITION:
0800
ASRAAM
AIR TO AIR
18 KM IR
MISSILE
RADAR
M
MFD STORES
TARGETS SCANNED
000
3162

Airbrake Status Indicator

When illuminated, the airbrakes are extended.

Arrestor Hook Status Indicator

When illuminated, the arrestor hook is lowered. Note: This only functions on carrier-based aircraft.

Flap Indicator
Displays the current status of the airplane's flaps, that is, how many degrees they've been lowered.

Fuel Indicator
Displays the amount of fuel your aircraft is carrying, both internally and externally.

Landing Gear Status Indicator
When illuminated, the undercarriage is down.

Reheat Status Indicator
When illuminated, afterburners are on.

Throttle Setting
Indicates the amount of thrust currently requested, measured as a percentage of total engine output (0-100%).

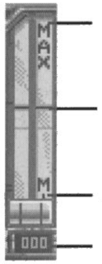
Thrust Percentage Indicator
Indicates what percentage of the requested thrust the engine is now producing.

For example, say you're flying an F/A-18, which has a maximum dry thrust of 9,620 kg. Say your engine is currently only producing 3000 kg of thrust. If you increase your throttle to 50% (that is, if you request 50% of 9620 kg = 4810 kg), the Thrust Percentage Indicator would read **62** (3000 is 62% of 4810).

Wheelbrake Status Indicator
When illuminated, wheelbrakes are on.

Throttle

The throttle grip indicates your current throttle setting.



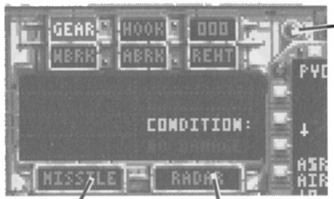
Maximum Thrust — 100%

Military Thrust — Varies

Minimum Thrust — 0%

Throttle Setting

Warning Lights



Stall Warning Signal

Missile Warning Signal

Target Warning Signal

Missile Warning Signal
Flashes when a missile is locked on your airplane. The type of missile fired at you appears in the Confirmation Display window.

Stall Warning Signal
Flashes when your aircraft has stalled.

Target Warning Signal
Is illuminated when your radar has detected an enemy target. If your MFD is *not* in Radar mode, the signal flashes; if the MFD *is* in Radar mode, it simply stays lit.

Throttle Control

J	Engines On/Off
+	Increase Throttle
-	Decrease Throttle
\	Cycle Minimum/Military/Maximum Thrust (Aircraft with no reheat capability, cycle minimum/military thrust)

Flight Stick Control

Birds of Prey monitors joystick, mouse and keyboard input *simultaneously*. You can use any or all of the input devices in the course of a mission, switching as often as you like between the three.

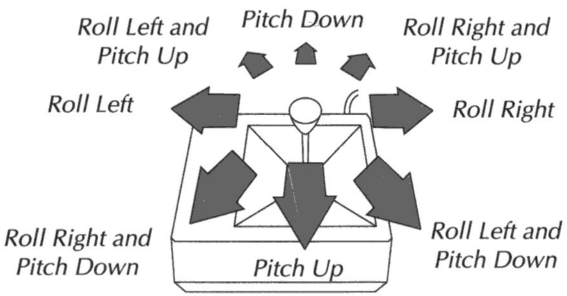
Auto-Centre

"Auto-Centring" is when the flight stick automatically returns to neutral when you release the joystick or let up on a flight key. When you take control of the airplane with the joystick or keyboard, the Auto-Centre feature is turned on — *the joystick and keyboard always auto-centre*. When you take control with the mouse, Auto-Centre is turned off — *the mouse never auto-centres.*

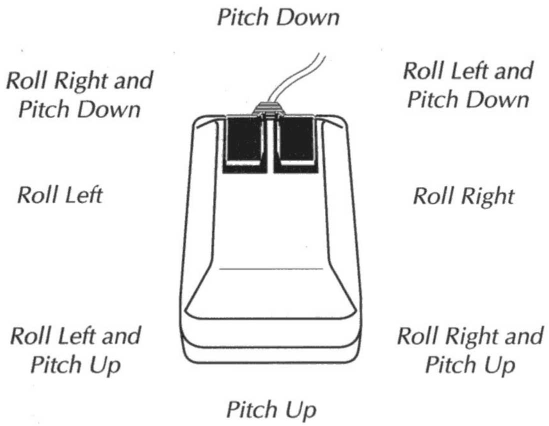
To turn the keyboard Auto-Centre on and off:

Press **Tab**.

Joystick


Roll Left and Pitch Up
Pitch Down
Roll Right and Pitch Up
Roll Left
Roll Right
Roll Right and Pitch Down
Pitch Up
Roll Left and Pitch Down

Mouse


Pitch Down
Roll Right and Pitch Down
Roll Left and Pitch Down
Roll Left
Roll Right
Roll Left and Pitch Up
Roll Right and Pitch Up
Pitch Up

Keyboard

Q	Pitch Down
A	Pitch Up
O	Roll Left
P	Roll Right
Tab	Auto-Centre On/Off

Rudder, Flaps & Airbrake

Del	Left Rudder
Help	Right Rudder
]	Flaps Down 1°
[	Flaps Up 1°
G	Airbrake Extended/Retracted

Other Flight Controls

U	Undercarriage Raised/Lowered
B	Engage Wheelbrake (You must hold this key down to continue braking)
H	Arrestor Hook Lowered/Raised

Left Alt	Swing wing forward (Swing-wing aircraft only) Vector thrust down (STOVL aircraft only) Open cargo doors (Cargo aircraft only)
Left Amiga	Sweep wing back (Swing-wing aircraft only) Vector thrust up (STOVL aircraft only) Close cargo doors (Cargo aircraft only)

Using Radar

Your radar can scan 180° forward to a maximum range of 320 km. If it were to scan everything in that area, it would detect a good number of targets. Since many of these targets would be irrelevant to the mission at hand, you can specify the area your radar scans by setting the radar *range* and radar *mode*. For example, let's say you were on a bombing mission. You could limit your radar scanning to "ground targets within 40 km."

Setting Radar Range

To cycle through the radar range settings:

Press **R**.

Alternately, you can set radar ranges using the Flight Menus. See **Flight Menus** below.

Setting Radar Modes

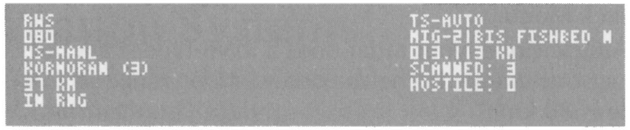
To change radar modes:

Press **N**.

Note: If you're in Navigation Mode, pressing the **N** key changes navigation locations. If you want to change radar modes in Navigation Mode, use the Flight Menus. See **Flight Menus** below.

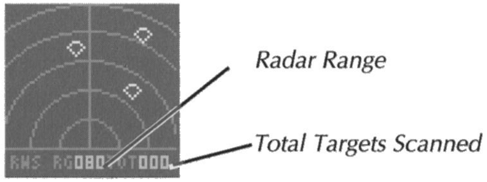
Range-While-Search (RWS) Mode

In RWS Mode, your radar scans 180° forward while tracking all targets before you. With the Instrument Panel off, RWS Mode tells you the number of targets before you and if any of them are hostile:



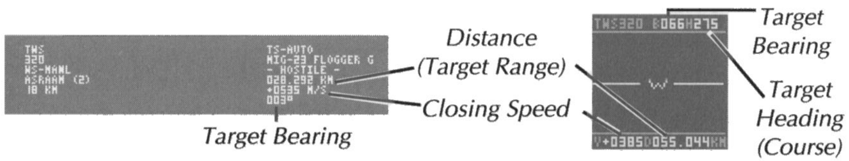
```
RWS                                    TS-AUTO
080                                    MIG-21BIS FISHBED N
WS-MANL                                013.113 KM
KORMORAN (3)                           SCANNED: 3
37 KM                                  HOSTILE: 0
IN RNG
```

RWS Mode is perhaps most useful when the Instrument Panel is on. The MFD displays the number of targets and gives you a notion of their approximate distance and bearing:



Track-While-Search (TWS) Mode

In TWS Mode, your radar scans 180° forward while tracking just the current target. The advantage to this mode is that it specifies the exact range and closing speed of the current target; the disadvantage is that you're only tracking one target instead of every target before you.



```
TWS                                    TS-AUTO
320                                    MIG-23 FLOGGER G
WS-MANL                                - HOSTILE -
ASRAAM (2)                             028.292 KM
 18 KM                                 +0535 M/S
                                       003°
```

HUD Mode

In HUD Mode, your radar does a TWS-type scan, but only objects in the narrow area defined by your HUD are tracked. This mode is very useful when friendly targets (such as wingmen) are flying to the side of your airplane.

Ground Attack Mode

In Ground Attack Mode, your radar does a RWS-type scan, but only ground objects are tracked. The maximum radar range in Ground Attack Mode is 80 km.

AS-4 Kitchen

The Soviet AS-4 Kitchen is a monstrous air-to-surface missile with a 460 km range. Aircraft capable of carrying are equipped with radar units capable of scanning the ground 320 km forward.

HARM and AS-9 Kyle

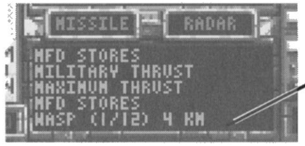
The HARM and AS-9 Kyle are anti-radar missiles. If either of these missiles are the current weapon, only radar-emmitting targets will be detected.

Gun-Director Mode

In Gun-Director Mode, your radar does a TWS-type scan, but only targets within the gun's narrow strike area are tracked. Because all guns have relatively short ranges, the maximum radar range in Gun Director Mode is 80 km.

Weapon Systems

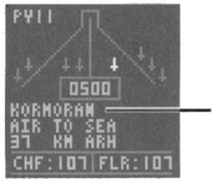
As you change weapons, the current weapon appears in the Confirmation Display.



```
MFD STORES
MILITARY THRUST
MAXIMUM THRUST
MFD STORES
WASP (1/12) 4 KM
```

Current Weapon Appears As You Change Weapons

The current weapons type, range, and the number of rounds left can be viewed by switching the MFD to Stores Mode. When the Instrument Panel is off, weapon information for the current weapon is always available at the bottom of the HUD.



```
KORMORAN
AIR TO SEA
37  KM ARH
CHF:107 FLR:107
```

Current Weapon

Target Selection

There are two target selection modes: automatic and manual. In automatic target selection mode (TS-AUTO), the airplane's targeting computer tracks the closest target detected by your radar. Of course, which targets your radar detects depends on the radar mode currently in use. For details on all five radar modes, see *Using Radar.*

In manual target selection mode (TS-MANL-SELECT/TRACK), you designate the target you want to track. The target must be within your radar's visibility cone — 180° forward from the nose of your airplane.

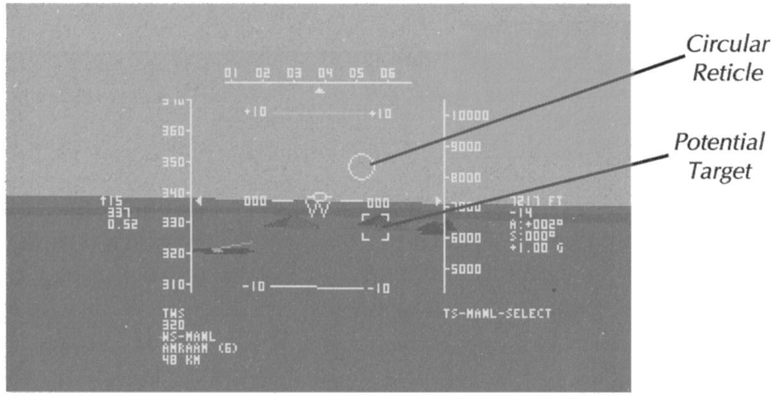
To switch between automatic and manual target selection:

Press **F2**.

Once you switch to manual target selection, you must select the target you want to track. *This must be done before you can take control of the airplane again.*

To select a target:

1. Use the mouse to move the circular reticle over a potential target (outlined with a broken box).


Circular Reticle
Potential Target
01 02 03 04 05 06
+10
+10
360
350
340
330
320
310
10000
9000
8000
6000
5000
000
000
-10
-10
↑15
337
0.52
1217 FT
-14
A:+002°
S:000°
+1.00 G
TWS
320
WS-MANL
AMRAAM (6)
48 KM
TS-MANL-SELECT

2. When the reticle is over a target, press **Z**.
3. If you select the wrong target or want to change targets, press **Z** again and repeat the procedure. **Important Note:** You must select a target or switch to TS-AUTO in order to regain control of your aircraft.

Weapon Selection

There are two weapon selection modes: automatic and manual. In manual weapon selection mode (WS-MANL), you select the current weapon. This is the game's default setting.

To select a different weapon as the current weapon:

Press **Left-Shift**.

In automatic weapon selection mode (WS-AUTO), the airplane's targeting computer identifies the current target and selects what it thinks is the most effective weapon to use against it.

To switch between manual and automatic weapon selection:

Press **F3**.

Firing The Current Weapon

To fire the current weapon:

Press the left mouse button.

Press button A on your joystick.

Press the **spacebar**.

Countermeasures

Chaff and flares are the standard countermeasures against incoming missiles. A chaff cartridge releases a cloud of metal strips into the air. Within 10 km, the strips act momentarily as a decoy for *radar-guided* missiles. A *flare* is a container — usually filled with magnesium — that ignites when dropped in the air. Within 5 km, flares serve as decoys for *infrared-guided* (heat-seeking) missiles.

Obviously, it helps to know when you're facing a radar-guided missile and when you're facing an IR-guided missile. The weapon descriptions in ***Section 6: Technical Reference*** will tell you what kind of missile is coming at you.

To release a cartridge:

Press **C** to release chaff.

Press **F** to release a flare.

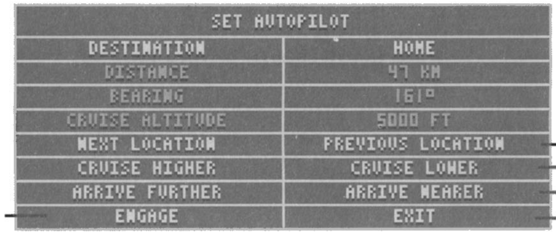
Autopilot

Use the Autopilot to "time warp" to a destination: a friendly airbase or aircraft carrier, or any waypoint you've set on the Tactical Map Display. You can only engage the Autopilot under the following conditions:

- There must be no hostile aircraft or missiles in the air (unless flying at Rookie level).
- You must be cruising at an altitude between 500 and 40,000 feet.
- You must have enough fuel to complete the journey.

To activate the Autopilot:

Press **Y**.



SET AUTOPILOT	
DESTINATION	HOME
DISTANCE	47 KM
BEARING	161°
CRUISE ALTITUDE	5000 FT
NEXT LOCATION	PREVIOUS LOCATION
CRUISE HIGHER	CRUISE LOWER
ARRIVE FURTHER	ARRIVE NEARER
ENGAGE	EXIT

Location Options
Altitude Options
Proximity Options
Engage Autopilot
Cancel Autopilot

When the Autopilot box appears, left-click on the following options to change settings:

Location Options

Left-click on Next Location or Previous Location to designate a different location as your destination. Keyboard Equivalents: **Period** (**.**) and **comma** (**,**)

Altitude Options

Left-click on Cruise Higher and Cruise Lower to change your cruising altitude. You can't cruise above 40,000 feet or below 500 feet. Keyboard Equivalents: **Cursor up** (↑) and **cursor down** (↓)

Proximity Options

If your destination is an airbase or aircraft carrier at which you're going to land, it's useful to arrive some distance away so you can line up your airplane with the runway. Left-click on Arrive Further to arrive further away from the destination. If you make a mistake, left-click Arrive Nearer to arrive closer to the destination. Keyboard Equivalents: **Cursor left** (←) and **cursor right** (→)

Engage

Left-click on Engage or press the **spacebar** to activate the Autopilot.

Exit

Left-click on Exit or press **Esc** to cancel the Autopilot and return to the mission.

Views

You can observe the mission from several vantage points — your airplane and missiles as well as friendly and enemy airplanes. The View, Zoom, and Scan Keys let you alter your view from each vantage point.

Default Point Of View

The default or "normal" point of view is in the cockpit of your airplane, looking forward.

To return to the default point of view:

Press **F10**.

Point Of View Keys

The Point Of View keys let you switch between the various points of view — your airplane, your missiles, and any friendly and enemy airplanes currently deployed.

To switch points of view:

Press **comma** (,) to view from the last point of view.

Press **period** (.) to view from the next point of view.

Cockpit ↔ External Toggle

You can switch between your internal view of the situation to an external view of your airplane.

To switch between cockpit and external views:

Press **Enter** on the numeric keypad.

View Types

The view types let you switch between internal and external views and control whether your view shifts with the airplane's movement or maintains a neutral "locked" position.

On the keyboard:

1 Cockpit View
2 Cockpit View — Roll Lock
3 Cockpit View — Pitch Lock
4 Cockpit View — Pitch & Roll Lock
5 External View
6 External View — Roll Lock
7 External View — Pitch Lock
8 External View — Pitch & Roll Lock

View Angles

From inside the cockpit of your airplane, the view angles let you scan the horizon for bogeys and targets. Outside the cockpit, the view angles give you stunning views of your airplane in action.

On the numeric keypad:

1 View Back & Left
2 View Back
3 View Back & Right
4 View Left
5 View Down
6 View Right
7 View Forward & Left
8 View Forward
9 View Forward & Right

---

*On reconnaissance and troop drop missions, a few keys on the numeric keypad have different functions. See Reconnaissance and Troop & Supply Drops in **Chapter 5: Mission Tactics** for details.*

Scan Keys

Press the **cursor** keys to rotate your view. You can scan from any of the 17 views, though certain Scan Keys will have no effect in locked views.

Zoom Keys

You can zoom in or out from any *external* view except "Fly Past."

0 or +	Zoom In
	Zoom Out

Airplane → Missile On/Off

With Airplane → Missile on, you'll automatically switch to your missile's point of view the next time you launch a missile. You'll stay with the missile until it explodes or you change your point of view. To turn the Airplane → Missile option on, press **X**; press **X** again to turn it off.

AWACS Information

Airborne Warning and Control Systems or AWACS, are surveillance aircraft that remain at a distance from the combat area, collecting and relaying radar contacts picked up by friendly ground radar. Your airplane's onboard navigation computers automatically process this information and present it in the form of a map and two reports.

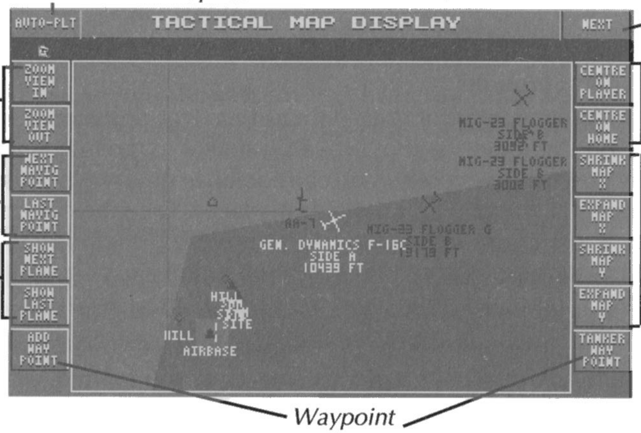
Tactical Map Display

The Tactical Map Display shows the entire conflict area. Plotted on the map are all friendly and enemy airbases, carriers, radar installations, SAM sites, factories and cities. The map also displays the current location of all friendly and enemy airplanes and missiles.

To turn the Tactical Map on:

Press **Return**. (If the Instrument Panel is on, you may want to turn it off first so you can see the whole map and use all of the options.)

The game is paused while you use the map. To go back to flying the mission, press **Return** again or click NEXT.


AUTO-PLT
TACTICAL MAP DISPLAY
NEXT
ZOOM VIEW IN
ZOOM VIEW OUT
NEXT NAVIG POINT
LAST NAVIG POINT
SHOW NEXT PLANE
SHOW LAST PLANE
ADD WAY POINT
CENTRE ON PLAYER
CENTRE ON HOME
SHRINK MAP X
EXPAND MAP X
SHRINK MAP Y
EXPAND MAP Y
TANKER WAY POINT
MIG-23 FLOGGER SIDE B 3092 FT
MIG-23 FLOGGER SIDE B 3002 FT
MIG-23 FLOGGER G SIDE B 19179 FT
AA-7
GEN. DYNAMICS F-16C SIDE A 10439 FT
HILL SAM SITE
HILL AIRBASE

Go to the Autopilot

Return to Combat

Zoom Options

vigation t Options

Show Plane Options

Centre Options

Shrink/ Expand Options

Waypoint Options

Left-click on any point on the map and the map will to scroll and centre on that position.

You can also use the options on either side of the map to set waypoints, zoom in and out, and centre the map on different locations. Left-click on any of the options to select.

Auto-Plt
Go to the Autopilot. Keyboard Equivalent: **Y**

For details on this option, see **Autopilot** under *Navigating*.

Next
Go back to flying the mission. Keyboard Equivalent: **Return**

Zoom Options
Click on the Zoom options to zoom in and out on the centre of the map. Keyboard Equivalents: **Plus** (+) and **minus** (-)

Navigation Point Options
Click on the Navigation Point options to centre the map on any navigation points — home base, airbases, aircraft carriers, waypoints you've set, etc. Keyboard equivalents: **9** and **0**.

Show Plane Options
Click on the Show Plane options to centre the map on the various friendly and enemy airplanes in the sky. Keyboard Equivalents: **Period** (**.**) and **comma** (**,**)

Waypoint Options
To add a waypoint for your onboard navigation computer, click on the Add Waypoint option. Move the cursor to the map and left-click to set down the waypoint. You can add up to nine waypoints. If you've set down a waypoint on the wrong place, place the cursor on it and click the right mouse button to remove it. Once you've set your waypoints, point to the Add Waypoint option and click the left mouse button. This gives you back the normal mouse cursor. Keyboard equivalent: **W**.

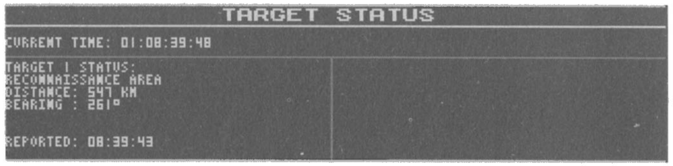
You can also designate a place to meet a tanker for mid-air refuelling. Click on the Tanker Waypoint option, move the cursor to the map, and click the left mouse button. You can only set one tanker waypoint at a time. If you've set down it on the wrong place, place the cursor on it and click the right mouse button to remove it. Once you've set your waypoints, point to the Tanker Waypoint option and click the left mouse button. This gives you back the normal mouse cursor. Keyboard equivalent: **T**.

Centre Options
Click on the Centre options to centre the map on your airplane or your home base. Keyboard Equivalents: **H** to centre on home base, **P** to centre on player

Shrink/Expand Options
Click on the Shrink/Expand options to decrease or increase the horizontal or vertical size of the map. A smaller map scrolls faster than a larger map. Keyboard Equivalents: **Cursor** keys (←↑→↓)

Target Status Report

The Target Status Report tells you the status of targets listed in your mission objectives. If you're currently viewing the mission from another aircraft's point of view, the Target Status Point gives you the status of its targets!



```
TARGET STATUS
CURRENT TIME: 01:08:39:48
TARGET 1 STATUS:
RECONNAISSANCE AREA
DISTANCE: 547 KM
BEARING : 261°

REPORTED: 08:39:43
```

To see the Target Status Report:

Press **T**. Note that the game is *not* paused as you look at the report. To go back to the mission, press **T** again.

Intelligence Report

The Intelligence Report is a record of everything that happened in the course of a mission — the exact times when aircraft took off and landed, targets were bombed, and aircraft shot down.

To see the Intelligence Report:

Press **V**. Note that the game is paused as you look at the report. Use the **cursor down** (↓) and **cursor up** (↑) key to scroll down and up if the report is longer than the screen.

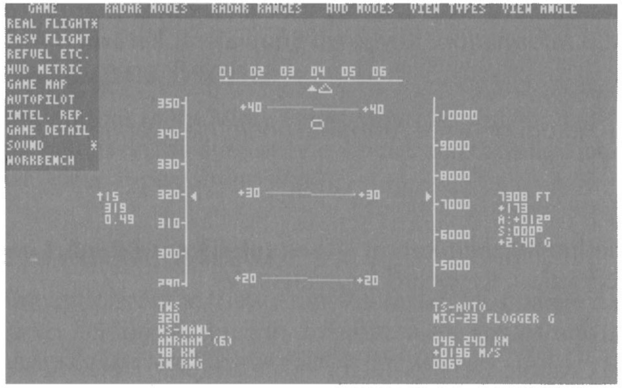
To go back to flying the mission, press **V** again. Alternately, you can press **Return** or click on the **Next** button.

Flight Menus

Most menu options in the Flight Menus are provided as alternatives to pressing keys. Some options, however, have no corresponding key and can only be accessed through the Flight Menus. Any keyboard equivalents are given with the descriptions below.

To choose an option from the Flight Menus:

Click the right mouse button or press **F4** until the game pauses. Move the mouse cursor up to the top of the screen and hold down the right mouse button. The Aircraft Menus appear. Move the mouse side-to-side to open a menu and up or down to highlight an option.


GAME
RADAR MODES
RADAR RANGES
HUD MODES
VIEW TYPES
VIEW ANGLE
REAL FLIGHT*
EASY FLIGHT
REFUEL ETC.
HUD METRIC
GAME MAP
AUTOPILOT
INTEL. REP.
GAME DETAIL
SOUND *
WORKBENCH
01 02 03 04 05 06
350
340
330
320
310
300
290
+40
+30
+20
10000
9000
8000
7000
6000
5000
↑15
319
0.49
7308 FT
+173
A:+012°
S:000°
+2.40 G
TWS
320
WS-MANL
AMRAAM (6)
48 KM
IN RNG
TS-AUTO
MIG-23 FLOGGER G
046.240 KM
+0196 M/S
006°

Release the mouse button to select the highlighted option. An asterisk (*) appears by any option that is currently active.

Game Menu

Real Flight

In Real Flight, airplanes fly at maximum realism — you must coordinate your turns to avoid slipping, avoid turns that can damage your aircraft, and landings must be reasonably gentle. Selecting Real Flight deactivates Easy Flight.

Easy Flight

In Easy Flight, airplanes don't fly realistically — that is, they are much easier to control! Selecting Easy Flight deactivates Real Flight.

Refuel etc.

Orders the ground crew to refuel and rearm your airplane. This allows you to undertake multiple strikes on enemy in the course of a single day. You must come to a complete standstill in the hangar of a friendly airbase or on the deck of an aircraft carrier before you can receive servicing.

HUD Metric

When activated, your velocity and altitude are displayed in metric units.

Game Map

Brings up the Tactical Map Display — see **Tactical Map Display** under *AWACS Information*. Keyboard Equivalent: **Return**

Autopilot

Brings up the Autopilot — see **Autopilot** under *Navigating*. Keyboard Equivalent: **Y**

Intel. Rep.

Brings up the Intelligence Report — see **Intelligence Report** under *AWACS Information*. Keyboard Equivalent: **V**

Game Detail

Brings up the Graphic Detail Selector — see **Graphic Detail Selector** under *Pilot Record* in ***Chapter 2: Preflight***. Keyboard Equivalent: **G**

Sound

Turns sound effects off and on. Keyboard Equivalent: **S**

Workbench/DOS

Quits the game and takes you to the Workbench (Amiga users) or DOS (PC users).

Radar Modes Menu

The options in the Radar Modes Menu let you change the current radar mode. For details on all five radar modes, see *Using Radar*. Keyboard Equivalent: **N** (except when currently in HUD Navigation, HUD Landing, or MFD Navigation modes)

Radar Ranges Menu

The options in the Radar Ranges Menu let you change the range of your radar. Keyboard Equivalent: **R**

HUD Modes Menu

The options in the HUD Modes Menu let you change your HUD Mode. For details on the various HUD modes, see *Head-Up-Display (HUD)* Keyboard Equivalent: **I**

View Types Menu

The options in the View Types Menu let you change your view type. For details on the different view types and their keyboard equivalents, see **View Types** under *Views*.

View Angle Menu

The options in the View Angle Menu let you change the angle of your view. For details on the different view angles and their keyboard equivalents, see **View Angle** under *Views*.

Mission Debriefing

The Mission Debriefing provides a variety of stats on your mission. You can also access two detailed reports from the Debriefing Menu.

To choose an option from the Debriefing Menu:

Move the mouse cursor up to the top of the screen and hold down the right mouse button. When the Debriefing Menu appears, move the mouse down and highlight an option.

If any of these reports are longer than the screen:

Use the **cursor down** (↓) and **cursor up** (↑) key.

To go back to flying the mission, press **V** again. Alternately, you can press **Return** or click on the **Next** button.

Chapter 4:

Basic Aerodynamics

The Basics of Flight

The flight model in ***Birds Of Prey*** is very accurate. Because of this, aircraft in the game exhibit both complex and subtle behaviour.

First Principles

The flight model is based on three principles:

1. A body remains at rest or in uniform motion in a straight line unless acted upon by a force.
2. A body's rate of change of momentum is proportional to the force causing it.
3. Any force on a body produces an equal and opposite force.

These are Newton's laws of motion. The "body" referred to can be anything: a car, a boat, even *you*. The force can also be anything: a car engine, the wind in the sails of a boat, or the muscles in your body.

The first and third laws are easy to understand. The second law is perhaps less easy to grasp fully. First, what is *momentum*?

Momentum is defined as "Mass x Velocity" — the weight of the object multiplied by its speed. In our everyday lives, we're aware of how much more difficult it is to stop a heavy moving object than a light moving object. The heavier object is said to have greater momentum.

So what is the *rate of change of momentum*?

We know that momentum is the product of mass and velocity. Since the mass of the object is assumed to be constant, the only way to change momentum is to the change the velocity. "Changing the velocity" is what we call *acceleration*.

The second law states that an object's acceleration is *proportional* to the force causing it. Mathematically expressed, this is:

"Force = Mass x Acceleration"

or

"F = ma"

From this equation we can model the action of forces on a body. If we rearrange the equation, we see that:

"Acceleration = Force / Mass"

or

"a = F/m"

If we have two bodies of equal mass, one can be made to accelerate faster by applying greater force to it. For example, if two cars of equal mass had engines capable of different power, the one with the more powerful engine could "out-accelerate" the other one. Similarly, if we take an engine of a given power output and put them in different cars — one heavy and one light — the lighter car will be faster simply because it has less mass to move.

But the force moving an object is not the only one we have to reckon with. There are also forces that may act against the acceleration of an object. For example, when we drive, we feed power from the engine to the wheels, which causes the car to accelerate. But all too soon we reach a point where no matter how much we press the pedal to the floor, the car doesn't go any faster. The acceleration seems to "stop" as we reach the car's top speed. What causes this?

As a car increases velocity, it moves through the air. But the air doesn't just "jump" out of the way. The car actually collides with the air forcing it to flow around the car. The shape of the car determines how smoothly it pushes air out of the way. Thus it's possible to have two cars of equal mass with identical engines, once of which can reach a higher top speed due to a more "aerodynamically-engineered" design.

Air resistance is only one of many forces retarding the motion of the car. The friction of moving engine parts can slow the car down as the engine revs higher, and even the wheels on ground have to overcome road friction.

As you'll see in a moment, an aircraft has similar forces acting on it as it moves through the air.

Units Of Measure

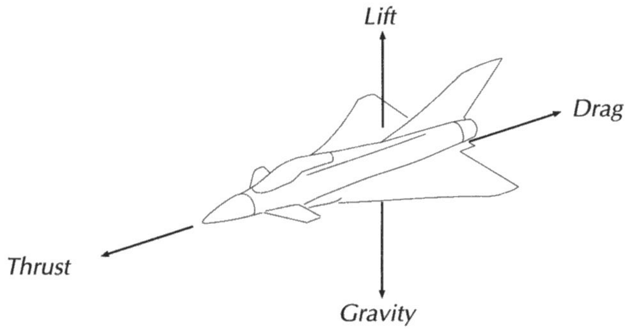
There are specific units used to express mass, force, velocity and acceleration:

Value	Units of Measure
Mass	Kilogrammes (kg)
Velocity	Metres/Second (m/s)
Acceleration	Metres/Second/Second (m/s/s)
Force	Newtons

You may wonder what a Newton is. A Newton is the unit that force is measured in. Since force is defined as Mass x Acceleration, Newtons are measured as kg x m/s/s. Specifically, a Newton is "the unit of force that imparts an acceleration of 1 m/s/s to a mass of 1 kg."

Four Forces

There are four main forces acting upon an aircraft in flight:



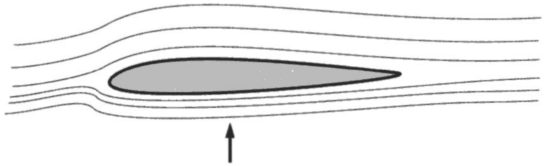
Gravity

Of the four forces, gravity is the only constant one. The force of gravity accelerates an object down toward the centre of the earth at a rate of 9.80665 metres/sec/sec.

Lift

Lift is literally "the force that lifts the aircraft off the ground," but how it's achieved involves some explanation.

As a wing moves through the air, air molecules flow either above the wing or below it. Wings are designed so that airflows faster above than it does below.



In fluid dynamics, the law is: The faster a gas or liquid flows, the less pressure it exerts on an object. Since we know the air moves faster over the arched top, there's less pressure there than on the underside of the wing. This inequality between pressure states is what creates lift.

From even this simple description, we can see that the generation of lift depends on many factors. If the wing isn't moving with respect to the air, no lift is generated. Also, we know that air pressure varies with altitude, so the amount of lift created depends on how high up the aircraft is.

Lift forces vary depending on the shape of a wing and the overall lift force is directly proportional to the size of the wing. For example, suppose you have two aircraft. Both have wings that are similarly shaped in the cross-section but one aircraft has twice the wing area of the other. If both aircraft are flying at the same altitude and velocity, the aircraft with the bigger wing will produce more lift. In fact, the bigger wing will produce almost exactly twice the lift of the smaller wing.

The following factors directly affect lift:

Wing Shape

Finding out how much the lift force is generated by wing shape is something that cannot be done in real-time in any flight model at present. Even in the aeronautical industry, a wing's lift force is found by experimentation — measuring lift forces on the wing shape in a wind tunnel. From these experiments it is possible to derive a value which — independent of the other factors — expresses the amount of lift a given wing can generate compared with any other wing. This value is known as the "Coefficient of Lift" or "CL".

Wing Area

The lift given by a wing is directly proportional to the plane view area of the wing.

Dynamic Pressure

Dynamic Pressure takes into account three things: air density and the velocity and acceleration (or Kinetic Energy) of the aircraft moving through it.

The Lift Equation

The mathematical equation for lift is actually used in the game's flight model. The lift equation then takes into account all three factors that make up lift.

Lift = Coefficient of Lift x Dynamic Pressure x Wing Area

or

Lift = CL • 1/2p • V^2 • S

Where S is the wing area, p is the air density, and V is velocity.

Like any force, lift is measured in Newtons. If we take this force and divide it by the mass of the aircraft, we get the lift acceleration. Once this lift acceleration is greater than gravity (9.80665 m/s/s), the force is great enough to lift the aircraft into the air.

Drag

Drag is created as the aircraft forcibly moves air molecules aside and works to slow the aircraft. In level flight, this factor is relatively constant, so that more thrust means faster speeds.

The Drag Equation

Once you understand lift, drag is relatively easy. Drag force calculations depend on almost the same set of factors as that of lift. The equation for the drag on a body is:

Drag = CD • 1/2p • V^2 • S

The "Coefficient of Drag" (CD) is the value which describes the aircraft's shape compared to that of another aircraft when all other factors remain constant. Unfortunately the "S" symbol here does *not* denote the surface area of the wing — rather, it is taken to mean the frontal area of the body. Thus in the case where two body's exist with the same CD and one has twice the frontal area of the other, the larger body will experience twice the drag.

Thrust

Thrust is what pushes the aircraft forward. The thrust of a jet engine is normally given as a Mass value. For example, the combined thrust of two General Electric F110 GE-400 Turbofans at maximum reheat equals 24,566 kg.

Comparing Thrust

To convert a mass to a force requires that we multiply by the acceleration — in this case, the acceleration due to gravity, 9.80665. Thus our thrust force in Newtons is:

Force = 24,566 kg x 9.80665 m/s/s = 240,910.1639 Newtons

A fully fuelled F-14A+ weighs about 26,400 kg. Without taking into account drag, its acceleration at maximum thrust is:

240,910.1639 N / 26,400 kg = 9.125 m/s/s

The F110 is a powerful engine. 9.125 m/s/s is approximately equal to the force gravity exerts on the aircraft. It is not surprising then that the F-14A+ is one of the fastest and most manoeuvrable aircraft in the air. However, there are aircraft with even higher thrust /weight ratios. The BAe Harrier must generate enough thrust to lift the aircraft vertically into the air with no lifting force on the wings whatsoever, and the F-15 Eagle has such a high thrust that it is able to exceed Mach 1.0 in a vertical climb, when the direction of the lift force from the wings has no component acting in opposition to gravity!

Stability & Control

Each force is opposed by another. In order for the aircraft to fly, lift must overcome gravity and thrust must overcome drag. In straight and level flight, with the aircraft neither climbing or descending, the opposing forces are equal:

Thrust = Drag

Lift = Weight

This is all very well, but pilots would have a hard time if the aircraft could only fly straight and level. How does the pilot make the aircraft climb, descend, and turn?

Angle Of Attack & Stalls

An aircraft is able to fly at different *angles of attack* (AOA). Roughly speaking, this is the angle between where the aircraft is *pointing* and where it's *headed.*

As the AOA grows larger, the lift force also grows. At a certain point, usually between about 20-30°, the airflow over the wing surface becomes turbulent. The air is no longer able to flow smoothly over the wing. At this point, the wing "stalls," and lift drops rapidly as drag increases. What happens then?

The tailplane saves the aircraft in this situation. As the AOA rises, the lifting force on the tailplane rises. The tailplane is normally offset by a small angle so that it stalls *after* the main wing. Since the tailplane is still creating lift, the nose drops and the tail rises, forcing the aircraft to descend rapidly. As the aircraft speeds toward the earth, the main wings regain smooth airflow once more and lift is once again created, thus averting disaster.

The only problem that can arise in this situation is if the aircraft is at very low speed and very low altitude. Unless enough height is available for the aircraft to drop it's nose and regain speed, the aircraft will surely crash.

Pitch Control

On each tailplane surface are movable elevators which control *pitch* or rotation around lateral axis.

By raising and lowering the elevators, lift on the tailplane is raised or lowered. When the elevators go up, lift falls and the lift turning force pushes down on the tailplane, pitching the nose up. This is what happens when the pilot pulls back on the control stick. When the elevators go down, the opposite occurs.

Flaps Increase Lift & Drag

When landing and taking off, most aircraft also use flaps on their main wings.

Flaps alter the shape of the main wing. The extra lift that flaps provide is often essential for big aircraft such as commercial jets, especially when fully loaded with passengers and fuel. Although the extra lift and drag is essential for most aircraft when landing, the extra drag is a problem at takeoff and this limits the usefulness of flaps in general.

Roll Control

Along with flaps, the main wings have movable surfaces called "ailerons" which control *roll* or rotation around the longitudinal axis. By moving the flight stick from side to side, the pilot causes the aileron on one wing to go up and the one on the other wing to go down. The "up" aileron loses lift and the "down" aileron gains lift. Since these uneven forces are far from the centre of gravity, a strong rolling motion is created.

When an aircraft is flying straight and level, the lift from the wings acts only to oppose gravity. But once the pilot rolls the aircraft, a fraction of this lift force acts in the lateral axis, thus reducing the amount of lift overcoming gravity.

To generate more lift while in a turn, the pilot pulls back on the flight stick — a process called "trimming." At the same time, the increased AOA increase drag, thus slowing the aircraft.

Yaw Control

On the ground, the rudder steers the aircraft like the rudder of a boat. In the air, the rudder controls *yaw* or rotation around the vertical axis (also known as slip).

Basic Manoeuvres

Level Flight

Level Flight is flying with your wings parallel to the ground, neither gaining nor losing altitude. The waterline marker on your HUD and artificial horizon on the Instrument Panel can tell you if you're wings are parallel to the ground, but the only way to know if you're gaining or losing altitude is to watch the vertical velocity indicator on the HUD or Instrument Panel.

Taking Off

To take off, your aircraft must accelerate from a standstill to an airspeed that generates enough lift to overcome gravity.

1. Increase power to 100%.
2. When your aircraft reaches about 160 mph, pull the flight stick back until your pitch is about 10°.
3. Press **U** to retract your landing gear.

Coordinated Turns

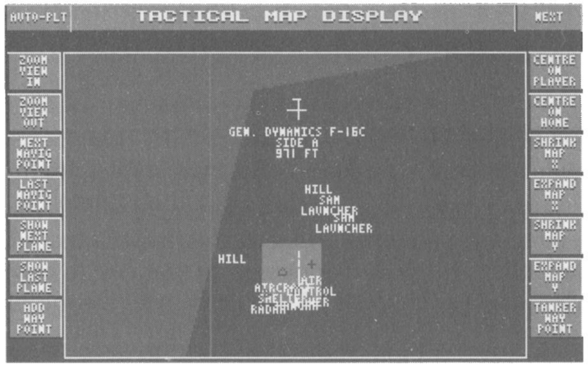
Turning involves the coordinated use of all three flight controls — ailerons, elevators and rudder.

1. You need sufficient power in order to sustain a turn for any length of time. If your in an low-powered aircraft, increase power.
2. Move the flight stick left or right. When your wings are at a 90° angle to the horizon, centre the flight stick.
3. To avoid losing altitude, pull back on the flight stick. As you turn, feed opposite rudder — for example, if your turning left, feed right rudder.

Landing

When landing, your aircraft must be travelling close to its minimum speed while still maintaining enough lift to avoid a stall.

1. Line up with the runway about 15 km away. Use the Tactical Map Display to help you.


AUTO-PLT
TACTICAL MAP DISPLAY
NEXT
ZOOM VIEW IN
ZOOM VIEW OUT
NEXT NAVIG POINT
LAST NAVIG POINT
SHOW NEXT PLANE
SHOW LAST PLANE
ADD WAY POINT
CENTRE ON PLAYER
CENTRE ON HOME
SHRINK MAP X
EXPAND MAP X
SHRINK MAP Y
EXPAND MAP Y
TANKER WAY POINT
GEN. DYNAMICS F-16C
SIDE A
971 FT
HILL
SAM LAUNCHER
SAM LAUNCHER
HILL
AIRCRAFT SHELTER
AIR CONTROL TOWER
RADAR

2. Ideally, you should be about 1000 ft up as you make your approach. Cut the throttle to 50% or less. Make sure that your airspeed is less than 300 kts. If you find you're still going too fast, extend your airbrakes momentarily.
3. Pitch the nose down so that you're vertical slip is - 5 to - 10 ft/s (tbd m/s).
4. At about 250 ft (tbd m) up, lower your undercarriage and extend flaps 15°. Adjust pitch so that you're vertical slip remains between - 5 and - 10 ft/s.
5. At about 30 ft (tbd m), cut throttle completely and pull back gently on the flight stick. The object is to stall at this point.
6. As soon as you touch down, apply wheelbrakes to slow down.

Autopilot For A Perfect Line Up

Lining up with the runway can often be difficult. Here's a sure fire means of making a perfect line up:

1. Press **Y** to bring up the Autopilot.
2. Select a friendly airbase (or a carrier if it's your home base) as your destination.
3. Select either proximity option to cruise at 1000 feet.
4. *Do not* choose to arrive further! Leave the distance as it currently is. Simply select **Engage** — you'll arrive 15 km away, lined up perfectly for a landing.

Landing In HUD Landing Mode

The HUD Landing mode helps you steer toward waypoints along the glideslope.

1. Approach the airbase or carrier.
2. Press **I** to switch to HUD Landing mode. Waypoint 1 is already selected.
3. Turn in the direction indicated by the turn arrow. Once you to bring the waypoint into view, manoeuvre so that you're heading directly toward it — the brackets [ ] should be near the middle of your windscreen.
4. When you're one or two kilometers away from Waypoint 1, press **N** to switch to Waypoint 2. Manoeuvre toward the next waypoint.
5. When you're one or two kilometers away from Waypoint 2, press **N** to switch to Waypoint 3. Manoeuvre toward this last waypoint.
6. As you approach the end of the runway, ignore the waypoints completely and concentrate on manoeuvring so that the small cross is on the end of the runway closest to you.

Standard Takeoff From An Aircraft Carrier

When an aircraft carrier is your home base, you begin the mission below deck. A lift automatically raises you to the deck and fixes the ship's catapult to your aircraft.

1. Increase power to 100%.
2. Press the **right square bracket** key ( ]) to lower flaps to 10°.
3. When your aircraft reaches 100% thrust, it will automatically be catapulted. *As soon as it's off the deck, pull back on the flight until your pitch is about 10°!*
4. Press **U** to retract your landing gear and the **left square bracket** key ([ ) .

Standard Landing On An Aircraft Carrier

1. Line up with the carrier runway about 15 km away. You may want to use the Autopilot, since lining up with a carrier runway can be extremely difficult.
2. You should be about 1000 ft up as you make your approach. Cut the throttle to 50% or less. Make sure that your airspeed is less than 300 kts. If you find you're still going too fast, extend your airbrakes momentarily.

3. Pitch the nose down so that you're vertical slip is - 5 to - 10 ft/s (1.5- 3.05 m/s).
4. At about 250 ft (76 m) up, lower your undercarriage and extend flaps 15°. Adjust pitch so that you're vertical slip remains between - 5 and - 10 ft/s. You may want to switch to HUD Landing mode so you can accurately pinpoint your touchdown point on the nearest end of the runway.
5. Press **H** to lower the arrestor hook.
6. At about 30 ft (9.15 m), cut throttle completely and pull back gently on the flight stick. The object is about to stall at this point.
7. As soon as you touch down, apply wheelbrakes to slow down. This must be done immediately!

Taking Off In STOVL Aircraft (Harrier or YAK-38)

1. If you're in a hangar, start your engines, increase throttle to around 15% and roll out to the runway.
2. Press and hold down the **Left Alt** key until your thrust is vectored vertically 89°. With the Instrument Panel on, your thrust vector setting appears where the Thrust Percentage Indicator normally appears. With the Instrument Panel off, it appears at the bottom of the screen.

   Note that once your thrust is vectored greater than 35°, the Remote Control System (RCS) is automatically activated. The RCS is a series of smaller jets far from the aircraft's centre of gravity that help keep the aircraft in level flight.
3. Increase throttle to 100%. When the Vertical Thrust/Weight Indicator on the HUD reads 0, the aircraft will take off.
4. Once the aircraft is 1000 ft up or higher, press the **Left Amiga** key to begin vectoring forward. The RCS will be automatically be deactivated as the aircraft reaches horizontal thrust — you may wish to hold down the right button to keep RCS active (35-0°).

Landing In STOVL Aircraft (Harrier or YAK-38)

1. Decrease thrust to around 45%.
2. Press **B** to extend the airbrake. Press the **right square bracket** key ( ]) to lower flaps (around 10°). You must slow the aircraft down to around 200 knots.

3. Press and hold down the **Left Alt** key to vector thrust down to 115°. As you do this, pull back on the joystick to keep yourself from nosediving.
4. Increase throttle to anywhere between 80 and 85% (this varies due to load on the plane). This is hover thrust.
5. When the plane is travelling around 40-80 knots, vector thrust to 90°, raise flaps and retract the airbrake. Decrease throttle until you start to drop gently to the ground.

Chapter 5:

Mission Tactics

Air-to-Air Combat

Air-to-air combat is the art of destroying the enemy in the air with missiles or gun.

Detection

The first task is to find the enemy. Visually sighting the enemy was the standard method of detection through World War I and most of the World War II, but two innovations have undermined the pilot's reliance on his own eyes. The first is onboard radar, which increases the pilot's means of forward detection far beyond his visual range. The second is the sheer speed of modern aircraft. Any manoeuvre undertaken at supersonic speeds will cover a huge arc in the sky — the chances of two opposed aircraft being within visual range of each other are much slimmer than they were in the days of prop-driven aircraft.

In ***Birds Of Prey***, there are three means of detection. The first, again, is by visual sighting. Even at long ranges, most aircraft appear as single-pixel dots, and the observant pilot will notice these against the sky or ground. The second is by radar. In order to detect the enemy, he must be somewhere in front of your aircraft's nose and within range of your radar's current setting. Make sure you're in an air-to-air Radar mode —Range-While-Search (RWS), Track-While-Search (TWS), HUD, or Gun-Director (GUN). Press **N** to set the Radar mode and **R** to set the range. The third means of detection is the Tactical Map Display, which will show you the location of every aircraft in the world. Obviously, no such device exists in reality (though many wish it did!), so if you like realism, don't use it.

Close & Attack

The second task is to close in and bring the enemy within range of your weapon. Press the **Left Shift** key to change weapons. Obviously, the longer your weapon's range, the more "stand off" created and the greater your advantage. Long- or medium-range missiles should be employed first, followed by short-range missiles. Your gun should be used as a last resort, when all of your missiles have been depleted.

When the target comes in range of your current weapon, the Target Lock Indicator diamond appears. To fire, press the **spacebar**, the left mouse button, or joystick button A.

Missile Guidance Types

There are three guidance types in ***Birds Of Prey***: active radar homing, semi-active radar homing, and infrared homing.

Infrared (IR) Homing

Infrared homing missiles — or "heat seekers" — home in on heat emissions created by the target's engines. Though early IR homing missiles were really only effective when aimed directly at the target's exhaust, modern heat seekers are "all aspect," that is, capable of being launched at the target from any direction. The seeker heads have also been greatly improved and are no longer prone to distraction by other heat sources such as the sun. The compact size of IR homing missiles make them much harder to be detected by any warning devices on the target's aircraft. The only disadvantage to these weapons is that they are only effective at short ranges.

Semi-Active Homing

Semi-active homing missiles rely on your aircraft's onboard radar to illuminate the target, homing in on the returning radar. The advantage to these missiles is that if they lose their target, they can easily re-acquire it as long as your radar provides illumination. The disadvantage is that you must continue to fly toward the target after launch, thus making yourself vulnerable to attack.

Active Radar Homing

No missile of any useful size could carry a radar unit large enough to completely track a target from launch to impact — nonetheless, pilots like weapons that don't require prolonged radar illumination of their prey. The active radar homing missile is a kind of compromise. Before launch, your aircraft's fire control computer takes the target's current speed and course and designates a point of interception. The missile is then launched, whereupon it flies silently to the pre-arranged point, switching on its small active radar unit only in the terminal phase. The big advantage to these weapons is that they're "fire and forget" weapons — once launched, the pilot is free to break away from the engagement or simply move to a safer distance.

Guns

The advanced cannon in ***Birds Of Prey*** have a maximum range of 10 km, however, your chances of hitting greatly improve if the target is within 6.5 km.

Bombing Missions

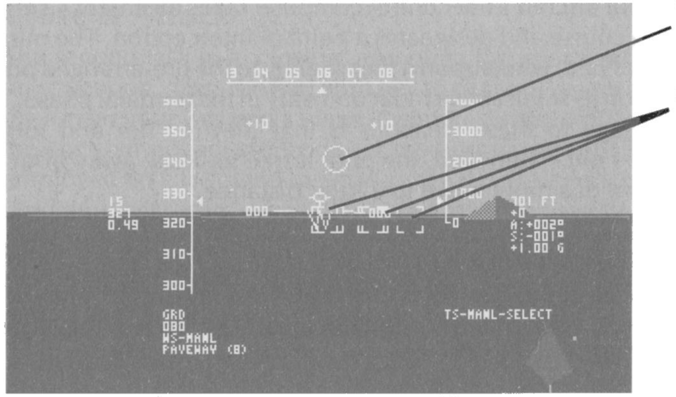
The primary purpose of bombing is to destroy the enemy's air capabilities on the ground. Aircraft stationed in shelters and hangars are obvious targets — especially since aircraft spend more time on the ground than in the air — but they're not necessarily the most important ones. Aircraft require runways to take off (except for the STOVL aircraft like the Harrier) and air control towers are necessary for controlling air traffic. Without these, long term deployment of aircraft becomes impossible.

Obviously, the defences surrounding airbases are equally important. Radar stations provide enemy interceptors with early warning of impending attacks and thereby become critical targets in any campaign. Enemy SAM sites also inhibit airfield strikes and thus must be destroyed.

The secondary purpose of bombing is to destroy the enemy's ability to replenish his forces. Since factories and cities supply the enemy with arms, these "civilian" centres become military targets as well.

The techniques for air-to-surface attacks vary depending on the type of weapon used. However, in all attacks on ground targets, your radar should be set on Ground (GRD) mode. Press **N** to set the Radar mode on Ground and **R** to set the range. Due to the curvature of the earth's surface, ground radar has a maximum range of 80 km.

Since ground targets are often "clustered" together — each airbase, for example, has no less than 5 potential targets — you may need to select your target manually. Press **F2** to switch to manual Target Selection mode (TS-MANL-SELECT/TRACK).


13 04 05 06 07 08
+10
+10
350
340
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000
701 FT
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A:+002°
S:-001°
+1.00 G
GRD
080
WS-MANL
PAVEWAY (8)
TS-MANL-SELECT

Circular Reticle

Potential Targets

Use the mouse to move the reticle over a potential target, and then press **Z** to select it. Once you've selected a target, press the **Left Shift** key to select one of the following types of air-to-surface weapon.

Air-To-Surface Missiles

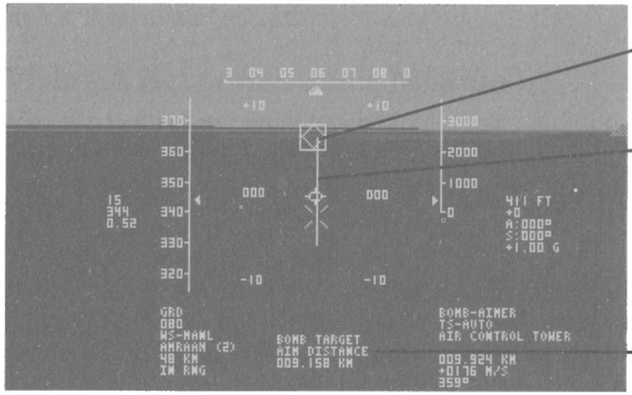
AS missiles are intelligent and highly manoeuvrable — as such, they need only be locked onto their target before firing. To launch, press the **spacebar**, left mouse button, or joystick button A.

Freefall Bombs

Freefall bombs have no intelligent guidance once they're dropped, so precise use of the HUD Bomb-Aimer is important.

The Instrument Panel only blocks your view of your ground target, so the first thing you should do is hide the Instrument Panel if it's currently displayed (press **W**). Press **I** to switch to HUD Bomb-Aimer mode.

Close in on the target at an altitude of 500 ft (tbd metres) or less. Put the aircraft in straight and level flight — your VSI should read 0. The target should have a bearing of 000°, with the Fall-Line should be lined up with the Tracking Box. Feed left or right rudder (**Del** or **Help**) to make slight adjustments to your course.


3 04 05 06 07 08 0
+10
+10
370
360
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340
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GRD
080
WS-MANL
AMRAAM (2)
48 KM
IN RNG
BOMB TARGET
AIM DISTANCE
009.158 KM
BOMB-AIMER
TS-AUTO
AIR CONTROL TOWER
009.924 KM
+0176 M/S
359°

Bombsight Predictor

Fall-Line Lined Up With Target

Aim Distance

Your fire control computer automatically calculates the point at which you should release the bomb, based on your airplane's current altitude, velocity, pitch and roll. The Aim Distance is the distance to this point. Watch the Aim Distance read-out and the Bombsight Predictor closely — when the Aim Distance is 0 and the Bombsight Predictor is over the target, press the **spacebar**, left mouse button, or joystick button A for each bomb you want to release.

Warning! If you're flying at low altitudes, pull up immediately after dropping any bombs! The blast can damage and even destroy your aircraft!

Special Weapons

The Paveway LGB Smart Bomb, SA Matra Durandal, Rockeye II Mk 20 Cluster Bomb, and the BLG 66 Belouga Bomb are all dropped in the same manner as normal free fall weapons. Of these, the Durandal is the only weapon that must be aimed with great precision. The Paveway uses laser-guidance to make adjustments to it's trajectory, thus doing some of the aiming for you, while the Rockeye and Belouga Bomb are both weapons that spread out over wide areas.

Close Support & Ground Support

Since World War II, the tank has been the queen of the battlefield. While tanks are primarily fought with missiles and other tanks, the aircraft has proven a worthy platform for anti-tank weapons. One of the most important roles of any air force is to harass the enemy's land force by striking directly at armoured targets on the battlefield.

See *Bombing Missions* above for details on firing air-to-surface missiles and dropping bombs.

Reconnaissance Missions

The first task of an air force in any conflict is to gather accurate information on the enemy's ability to wage war. This is necessary for both gauging the enemy's resources and identifying potential targets.

There are two approaches to reconnaissance. High-altitude aircraft can fly at speeds above Mach 3, giving enemy interceptors the nearly impossible task of climbing to altitude in time to launch weapons. Obviously, this requires a highly specialized, dedicated reconnaissance aircraft like the SR-71 or TR-1A. The other approach is a low-altitude, dash over enemy airspace. Almost any camera-equipped aircraft can achieve this — providing it flies with fighter escort. The only exception to this is the F-117, which relies on stealth technology for protection rather than armed escorts.

Flying A Reconnaissance Mission

Close in on the reconnaissance target at any altitude above 1000 ft (305 metres). Put the aircraft in straight and level flight — your VSI should read 0. If the Instrument Panel is currently displayed, press **W** to hide it.

Press **5** on the numeric keypad to switch to camera view. Use the cursor keys to aim the camera; press **+** and **-** on the numeric keypad to zoom in and out. Once you've framed the target, press the **spacebar**, the left mouse button, or joystick button A to activate the camera. Once you've photographed the target, press **F10** to return to the cockpit view.

Troop & Supply Drops

Troop and supply drops are necessary to replenish friendly ground forces with both men and equipment. Such timely assistance can turn the tide of a battle.

Executing A Troop Drop

Once you've taken off, switch to Navigation mode — press **M** to switch to MFD Navigation mode or **I** to switch to HUD Navigation mode. Press **N** to select a troop drop point (TD) as your current navigation waypoint.

Close in on the drop site at an altitude between 4000 and 5000 ft (1220-1525 metres). Put the aircraft in straight and level flight — your VSI should read 0. If the Instrument Panel is currently displayed, press **W** to hide it. When your aircraft is about 2 km from the drop site, press **2** to switch to an interior view of the aircraft's tail. Hold down the **Left Alt** key until the bay hatch opens.

Watch the navigation computer — when you're aircraft is about 1 km from the drop site, press the **spacebar**, the left mouse button, or joystick button A to drop a troop. Once the troop is out of the hatch, press the **Left Amiga** key to close the bay hatch. Press **F10** to return to the cockpit view.

Executing A Supply Drop

Once you've taken off, switch to Navigation mode — press **M** to switch to MFD Navigation mode or **I** to switch to HUD Navigation mode. Press **N** to select a supply drop point (SD) as your current navigation waypoint.

Close in on the drop site at an altitude below 100 ft (20 metres). Put the aircraft in straight and level flight. It's critical that your VSI read 0 — you're flying at such a low altitude that you don't have much room to descend before crashing! If the Instrument Panel is currently displayed, press **W** to hide it. When your aircraft is about 2 km from the drop site, press **2** to switch to an interior view of the aircraft's tail. Hold down the **Left Alt** key until the bay hatch opens.

Watch the navigation computer — when your aircraft is directly over the drop site, press the **spacebar**, the left mouse button, or joystick button A to drop your supply. Once it's out the hatch, press the **Left Amiga** key to close the bay hatch. Press **F10** to return to the cockpit view.

Test Piloting

Test piloting is unlike any of the other missions you'll encounter in ***Birds Of Prey***. The test pilot explores an aircraft's design by pushing it to the utmost limits. This is seriously dangerous work — as dangerous as combat itself, even though no one is shooting at you.

Your choice of aircraft for this mission is limited. Side A can fly the famous X-15 to the edge of the atmosphere; Side B can take up the latest Soviet fighters, the MiG-29 and Su-27.

You begin the mission in the hangar of your home base. You're aircraft is secured to the wing of a B-52 (Side A) or An-124 (Side B), which will ferry you up into the air. You control the bomber for the first part of the mission — it's up to you to get it off the ground and climb to a 40,000 ft (12,197 metres).

Once you're over 1,000 ft (tbd metres), press the **Right Shift** key to release the experimental aircraft. A message appears telling you that you're now in control of the experimental aircraft. Press **F10** to go to the other cockpit.

Flying The X-15

You begin with your engines at 0% throttle. Press **J**, and press the **backslash** key (\) twice to go to full throttle. At full throttle, you have 85 seconds of fuel. The object is to take the aircraft to very edge of the atmosphere — point the aircraft up and let her rip! When you hit the upper reaches of the atmosphere, you'll begin to lose lift. The X-15's reaction control system (RCS) will automatically be activated to give you limited control as you fly at the edge of space.

The X-15 reached a maximum altitude of 354,200 ft (107,960 m). If you manage to break this altitude record, you can be happy. But your job isn't over yet — you still have to somehow get you and your machine back down...

Mid-Air Refuelling

Mid-air refuelling extends your aircraft's range infinitely and — since you're free of any external fuel tanks — allows you to carry a full weapon load.

The first step in mid-air refuelling is to designate a rendezvous point with a tanker. This is done on the Tactical Map Display. Press **Return** to bring up the display. Select the **Tanker Waypoint** option and set down a waypoint somewhere on the map. Press **Return** to go back to the mission.

The tanker won't actually be deployed until you press the **backslash** key (/). When to call for it depends completely on the mission you're flying and the ranges involved. You must allow time for the tanker to take off and travel to the waypoint. If it reaches the waypoint before you, it will wait and circle — however, you don't want it to be a sitting duck for enemy fighters.

Once both you and the tanker reach the waypoint, you must manoeuvre to within range in order to activate the refuelling autopilot. The range depends on the difficulty level of the game:

Rookie	20 km
Pilot	15 km
Squadron Leader	10 km
Wing Commander	5 km

The following conditions must also be met (regardless of the difficulty level):

- Your altitude must be above 5,000 feet (1525 m).
- You must be within 250 feet (75 m) of the tanker's altitude.
- Your course (heading) must be within 25° of the tanker's heading.
- You must be travelling within 50 m/s of the tanker's velocity.

Once the autopilot is activated, the game takes over and refuels your aircraft. During this time, you're free to use the view keys in order to watch the refuelling.

Chapter 6:

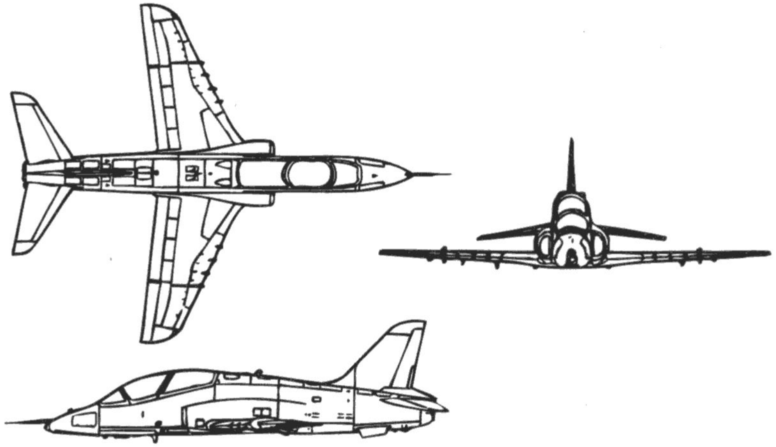
Technical Reference

Aircraft & Weapon Descriptions

NATO & Allied Airplanes

British Aerospace Hawk Mk.66

Country of Origin: UK. In the late 60s, the RAF called for a new jet trainer to replace the Jet Provost and Gnat Trainer. Designs were submitted, and the Hawk (then called the HS.1182) was chosen for development. The result was a straightforward two-seat trainer/light interceptor of surprising capabilities.



Weights & Dimensions:

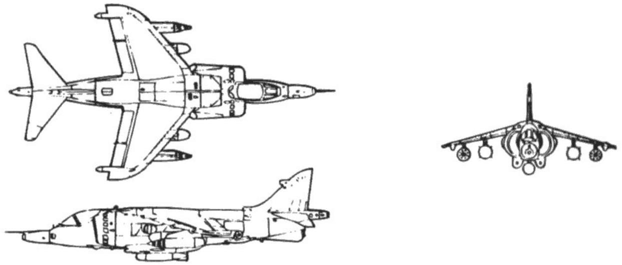
Unladen Weight:	3380 kg
Max. Takeoff Weight:	5125 kg
Height:	4.0 m
Length:	11.8515 m
Width:	9.3906 m
Wing Area:	16.6914 m2

Performance:

Powerplant:	One Adour Mk 861 Turbofan
Max. Dry Thrust:	2585 kg
SFC (Dry Thrust):	0.7399 kg/dan x h The jet has no reheat capability
Max. Velocity:	Mach 0.81
Service Ceiling:	10970 m (35976 ft)
Max. Internal Fuel:	1292 kg
Max. Ferry Range:	680 miles (1094 km)

British Aerospace Hawker Siddley Harrier GR.Mk 3

Country of Origin: UK. Recognising that NATO airbases were vulnerable to quick missile attack from forward-based Soviet silos, the US, UK, and Germany began collaborating in the early 60's on the world's first short take off/vertical landing (STOVL) aircraft, the Kestrel. This was made possible by Bristol Aero-Engine's new Pegasus engine, which could be vectored from a rearward position down toward the ground to lift the aircraft vertically. When Germany withdrew from the program, the British continued independent development on the new aircraft. The result was the Harrier, the first STOVL aircraft ever to see operational status. Variations of the Harrier serve as a close support and tactical reconnaissance airplanes for the RAF, the Royal Navy, the US Marines, and the Spanish Navy.



Weights & Dimensions:

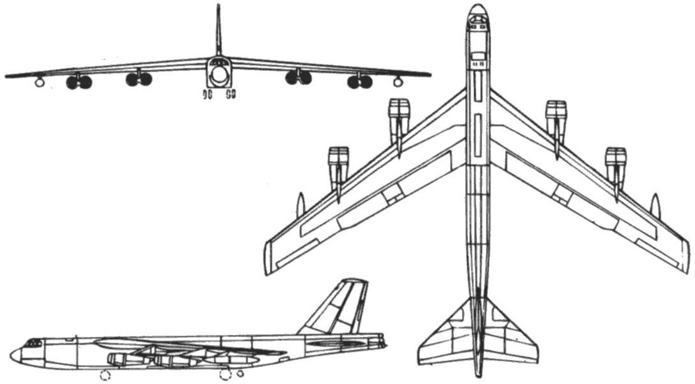
Unladen Weight:	5533 kg
Max. Takeoff Weight:	11793 kg
Height:	3.4179 m
Length:	14.5 m
Width:	7.6015 m
Wing Area:	18.6796 m2

Performance:

Powerplant:	One Rolls-Royce Pegasus Mk 105 vectored thrust turbofan
Max. Dry Thrust:	8505 kg
SFC (Dry Thrust):	0.78 kg/dan x h
Max. Reheat Thrust:	9607 kg
SFC (Reheat Thrust):	1.88 kg/dan x h
Max. Velocity:	Mach 0.97
Service Ceiling:	15240 m (49980 ft)
Max. Internal Fuel:	2290 kg
Max. Ferry Range:	3331 miles (5359 km)

Boeing B-52H Stratofortress

Country of Origin: US. The first production line B-52 appeared in 1954, and the series has seen has seen numerous revisions over the last 30 years. Nonetheless, the B-52 still forms the backbone of the Strategic Air Command and will probably continue to be a viable strategic bomber into the next century. The B-52H — making its debut in 1961 — features the more powerful TF33 turbofan engines and can carry a wide variety of missiles.



Weights & Dimensions:

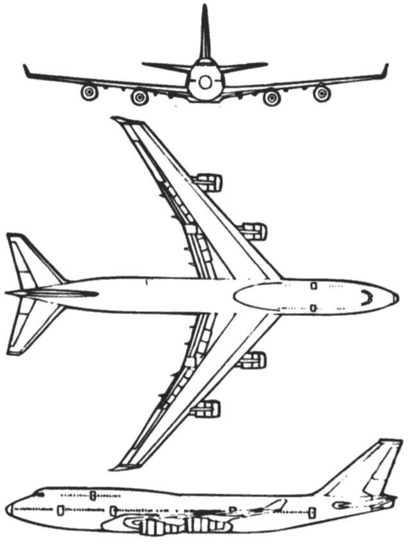
Unladen Weight:	87200 kg
Max. Takeoff Weight:	229064 kg
Height:	12.375 m
Length:	49.0312 m
Width:	56.3437 m
Wing Area:	371.5937 m2

Performance:

Powerplant:	Eight Pratt and Whitney TF33-P-3 Turbofans
Max. Dry Thrust:	61688 kg
SFC (Dry Thrust):	0.2066 kg/dan x h The jet has no reheat capability
Max. Velocity:	Mach 0.77
Service Ceiling:	15240 m (49980 ft)
Max. Internal Fuel:	119160 kg
Max. Ferry Range:	10130 miles (16299 km)

Boeing 747-400 Jumbo Jet

Country of Origin: US. The 747-400 is a long-range development of the highly successful 747 line, capable of flying over 13,000 km non-stop. As a passenger jet, it can carry 450-630 passengers.



Weights & Dimensions:

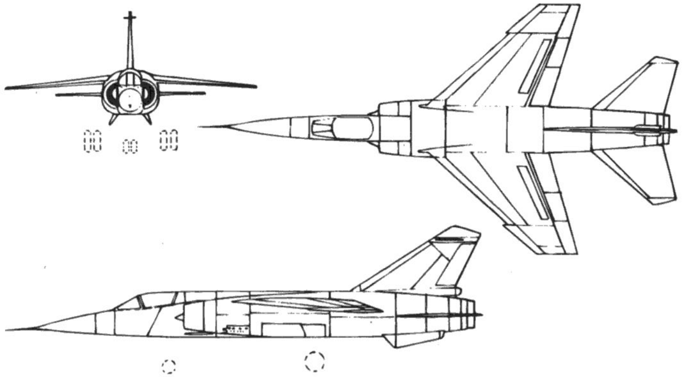
Unladen Weight:	177440 kg
Max. Takeoff Weight:	394624 kg
Height:	19.25 m
Length:	70.625 m
Width:	64.625 m
Wing Area:	524.875 m2

Performance:

Powerplant:	Four Rolls-Royce RB.211 524D4D turbofans
Max. Dry Thrust:	105232 kg
SFC (Dry Thrust):	0.552 kg/dan x h
	The jet has no reheat capability
Max. Velocity:	Mach 0.88
Service Ceiling:	10670 m (34992 ft)
Max. Internal Fuel:	192448 kg
Max. Ferry Range:	9445 miles (15197 km)

Dassault-Breguet Mirage F.1E

Country of Origin: France. The Mirage F.1 is a single-seat fighter/ground attack aircraft capable of Mach 2. Its swept wings mark Dassault's abandonment of earlier delta-wing designs, and the F.1's superior agility and handling show that this was a step in the right direction. The F.1E is an all weather strike version with more advanced avionics.



Weights & Dimensions:

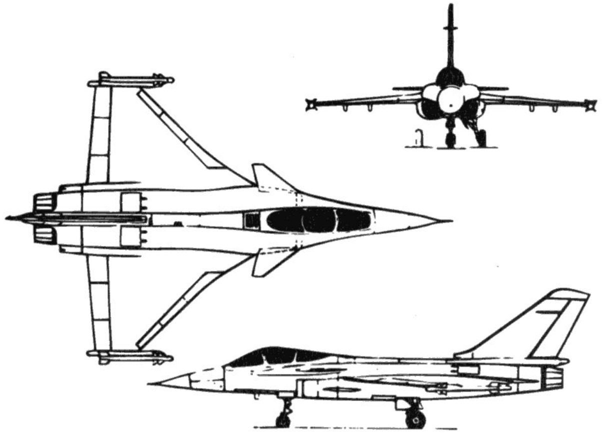
Unladen Weight:	7400 kg
Max. Takeoff Weight:	11500 kg
Height:	4.5312 m
Length:	15.5117 m
Width:	8.3984 m
Wing Area:	25.0 m2

Performance:

Powerplant:	One SNECMA Atar 9K-50 afterburning turbojet
Max. Dry Thrust:	4500 kg
SFC (Dry Thrust):	0.8599 kg/dan x h
Max. Reheat Thrust:	7200 kg
SFC (Reheat Thrust):	2.0 kg/dan x h
Max. Velocity:	Mach 2.50
Service Ceiling:	21250 m (69690 ft)
Max. Internal Fuel:	3350 kg
Max. Ferry Range:	2340 miles (3765 km)

Dassault-Breguet Rafale A

Country of Origin: France. While the rest of Europe backed the European Fighter Aircraft (EFA), the French looked to Dassault's heavier Rafale. This single-seat air superiority fighter features a very advanced delta-wing/forward canard design and the latest in fly-by-wire controls.



Weights & Dimensions:

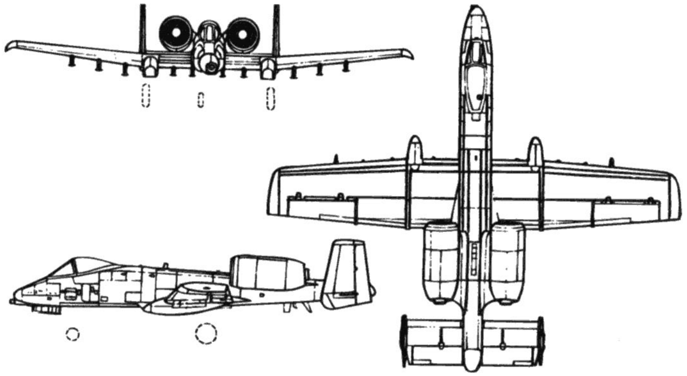
Unladen Weight:	9500 kg
Max. Takeoff Weight:	20000 kg
Height:	5.1796 m
Length:	15.789 m
Width:	11.1796 m
Wing Area:	47.0 m2

Performance:

Powerplant:	Two General Electric F404-GE-100 augmented turbofans
Max. Dry Thrust:	9620 kg
SFC (Dry Thrust):	0.8499 kg/dan x h
Max. Reheat Thrust:	14334 kg
SFC (Reheat Thrust):	2.7548 kg/dan x h
Max. Velocity:	Mach 2.00
Service Ceiling:	15240 m (49980 ft)
Max. Internal Fuel:	6000 kg
Max. Ferry Range:	3000 miles (4827 km)

Fairchild A-10A

Country of Origin: US. The A-10A is a heavily-armoured, single-seat close support/ground attack aircraft constructed around a massive seven-barrel 30mm "tank-busting" gun. All major systems on the A-10 are heavily-shielded and duplicated to reduce the chance of the aircraft being crippled through anti-aircraft fire. Externally, the airplane can carry a vast array of bombs and missiles on 11 pylons.



Weights & Dimensions:

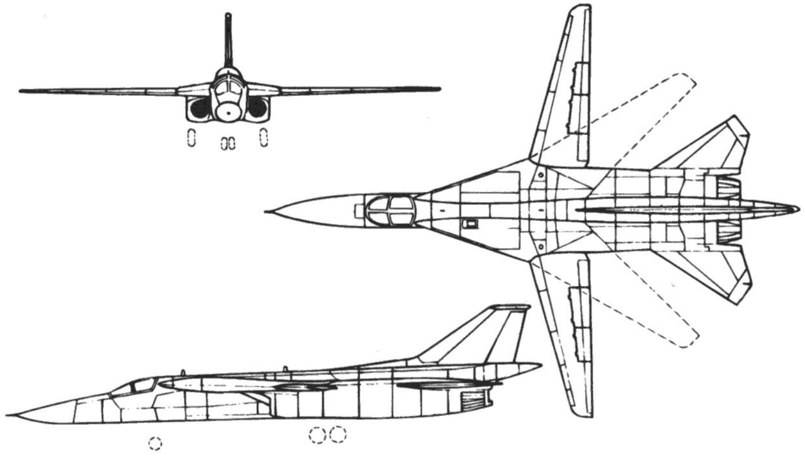
Unladen Weight:	11321 kg
Max. Takeoff Weight:	22680 kg
Height:	4.4687 m
Length:	16.25 m
Width:	17.5195 m
Wing Area:	47.0195 m2

Performance:

Powerplant:	Two General Electric TF-34-100 turbofans
Max. Dry Thrust:	8224 kg
SFC (Dry Thrust):	0.363 kg/dan x h The jet has no reheat capability
Max. Velocity:	Mach 0.55
Service Ceiling:	3050 m (10002 ft)
Max. Internal Fuel:	4853 kg
Max. Ferry Range:	4091 miles (6582 km)

General Dynamics F-111

Country of Origin: US. This two-seat strategic bomber was the world's first operational swing-wing aircraft. It's variable-geometry wings allow for minimal take off and landing lengths as well as high altitude dashes at speeds over Mach 2.



Weights & Dimensions:

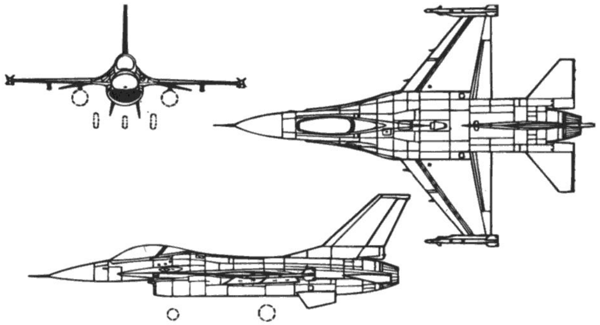
Unladen Weight:	20943 kg
Max. Takeoff Weight:	51846 kg
Height:	4.4804 m
Length:	22.3984 m
Width (Unswept):	19.1992 m
Width (Swept):	1.9531 m
Wing Area:	48.789 m2

Performance:

Powerplant:	Two Pratt and Whitney TF30-100 augmented turbofans
Max. Dry Thrust:	14231 kg
SFC (Dry Thrust):	0.66 kg/dan x h
Max. Reheat Thrust:	22770 kg
SFC (Reheat Thrust):	2.78 kg/dan x h
Max. Velocity:	Mach 2.19
Service Ceiling:	18290 m (59982 ft)
Max. Internal Fuel:	8000 kg
Max. Ferry Range:	5093 miles (8194 km)

General Dynamics F-16C

Country of Origin: US. Air combat in Vietnam demonstrated that very large, heavy fighters were at a disadvantage in low altitude air-to-air combat and that Mach 2 capability was less than a big deal in most dogfights. The F-16 was developed specifically to address this problem. As a light, single-seat, multi-role aircraft, the F-16 is both highly manoeuvrable at low levels and capable of speeds over Mach 2 at altitude. Though it has a fundamentally unstable airframe, state-of-art fly-by-wire controls keep it within its performance envelope, earning it the nickname of "The Electric Jet." With the exception of an enlarged tailfin, the F-16C maintains the basic design of its predecessors but features updated systems.



Weights & Dimensions:

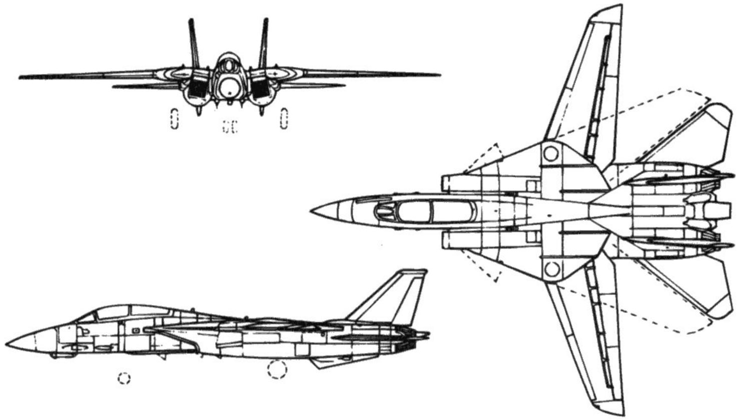
Unladen Weight:	6866 kg
Max. Takeoff Weight:	17010 kg
Height:	5.0117 m
Length:	14.5195 m
Width:	9.4492 m
Wing Area:	27.8789 m2

Performance:

Powerplant:	One General Electric F110-GE-100 augmented turbofan
Max. Dry Thrust:	6350 kg
SFC (Dry Thrust):	0.68 kg/dan x h
Max. Reheat Thrust:	12520 kg
SFC (Reheat Thrust):	2.55 kg/dan x h
Max. Velocity:	Mach 2.05
Service Ceiling:	15240 m (49980 ft)
Max. Internal Fuel:	3162 kg
Max. Ferry Range:	3890 miles (6259 km)

Grumman F-14A+ Tomcat

Country of Origin: US. This two-seat, carrier-borne interceptor is the US Navy's equivalent to the US Air Force's F-15. Variable-geometry wings allow it to fly just over Mach 1 at sea level and over Mach 2 at altitude. The F-14's original Pratt & Whitney powerplant was found to be inadequate for a fighter, so the F-14A+ features the more powerful General Electric F110-GE-400 engines.



Weights & Dimensions:

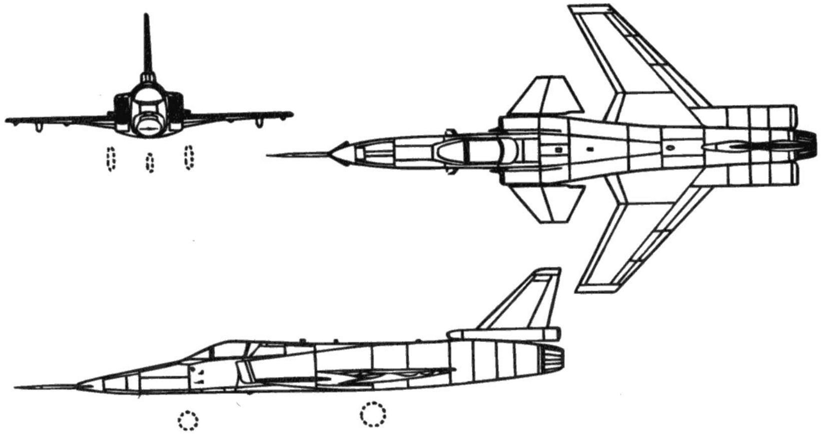
Unladen Weight:	19050 kg
Max. Takeoff Weight:	34020 kg
Height:	4.8789 m
Length:	18.8984 m
Width (Unswept):	19.5507 m
Width (Swept):	11.4492 m
Wing Area:	52.5 m2

Performance:

Powerplant:	Two General Electric F110-GE-400 turbofans
Max. Dry Thrust:	14668 kg
SFC (Dry Thrust):	0.66 kg/dan x h
Max. Reheat Thrust:	24566 kg
SFC (Reheat Thrust):	2.78 kg/dan x h
Max. Velocity:	Mach 2.34
Service Ceiling:	17067 m (55971 ft)
Max. Internal Fuel:	7350 kg
Max. Ferry Range:	2000 miles (3218 km)

Grumman X-29

Country of Origin: US. During World War II, German engineers studied the advantages of forward-swept wings, but is wasn't until the 1980s that research into the design was pursued again with any vigour. Though the X-29 is a fundamentally unstable design, modern fly-by-wire controls assist the pilot and keep the aircraft in the air. The result is a highly manoeuvrable and efficient prototype.



Weights & Dimensions:

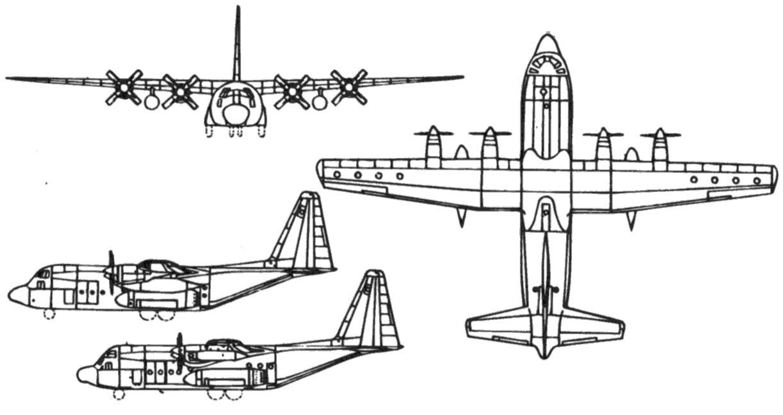
Unladen Weight:	5625 kg
Max. Takeoff Weight:	14878 kg
Height:	4.3437 m
Length:	14.6796 m
Width:	8.2968 m
Wing Area:	17.1992 m2

Performance:

Powerplant:	One General Electric F404-GE-400 augmented turbofan
Max. Dry Thrust:	5003 kg
SFC (Dry Thrust):	0.8499 kg/dan x h
Max. Reheat Thrust:	7454 kg
SFC (Reheat Thrust):	2.7548 kg/dan x h
Max. Velocity:	Mach 1.80
Service Ceiling:	16771 m (55001 ft)
Max. Internal Fuel:	1814 kg
Max. Ferry Range:	Not given

Lockheed C-130H-30 Hercules

Country of Origin: US. The C-130 has enjoyed a 40 year reputation as the most successful and widely used transport in the western world. Over 55 nations employ some 1900 of these beasts, the basic model having been refitted for such diverse roles as weather reconnaissance, communications, drone and spacecraft recovery, and aircraft and helicopter refuelling. The H model is fitted with the more powerful T56 turboprop engine and with a 9,070 kg payload can travel 7,410 km.



Weights & Dimensions:

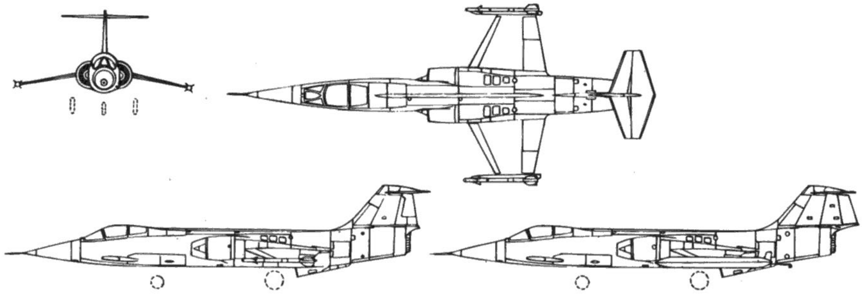
Unladen Weight:	36080 kg
Max. Takeoff Weight:	70304 kg
Height:	11.6562 m
Length:	34.3437 m
Width:	40.4062 m
Wing Area:	162.0937 m2

Performance:

Powerplant:	Four 4,508 ehp Allison T56-A-15 turboprops
Max. Velocity:	Mach 0.58
Service Ceiling:	6095 m (19988 ft)
Max. Internal Fuel:	23000 kg
Max. Ferry Range:	5354 miles (8614 km)

Lockheed F-104S Starfighter

Country of Origin: US. The Starfighter was developed after the Korean War proved the need for a fast-climbing interceptor. The first operational Mach 2 fighter, the F-104 was built in large numbers and remained operational for over 30 years. Thousands were built in North America, Europe and Japan, and nearly every nation allied with the west bought the Starfighter, making it one of the most successful fighters in the world.



Weights & Dimensions:

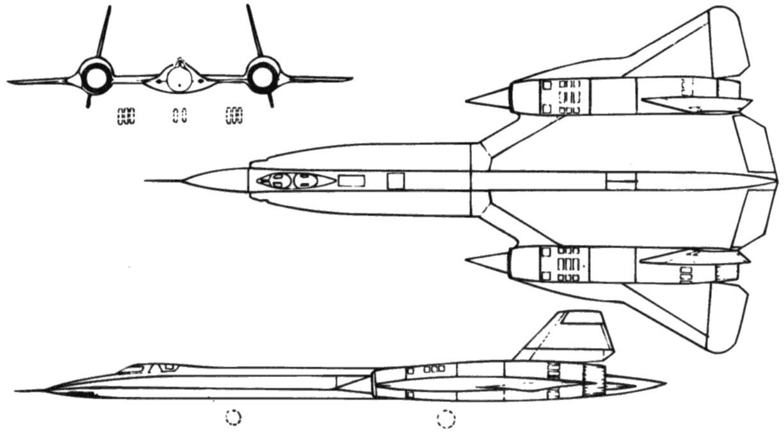
Unladen Weight:	6758 kg
Max. Takeoff Weight:	14060 kg
Height:	4.1093 m
Length:	16.6914 m
Width:	6.6796 m
Wing Area:	18.1992 m2

Performance:

Powerplant:	One General Electric J79-19 afterburning turbojet
Max. Dry Thrust:	5353 kg
SFC (Dry Thrust):	0.8599 kg/dan x h
Max. Reheat Thrust:	8119 kg
SFC (Reheat Thrust):	2.0 kg/dan x h
Max. Velocity:	Mach 2.39
Service Ceiling:	27430 m (89957 ft)
Max. Internal Fuel:	3392 kg
Max. Ferry Range:	1815 miles (2920 km)

Lockheed SR-71 Blackbird

Country of Origin: US. Retired in 1989, the SR-71 Blackbird was a high-altitude reconnaissance aircraft capable of Mach 3 — the fastest and highest-flying jet in the world. Built of titanium and stainless steel — to withstand the high temperatures of Mach 3 flight — less than 50 of these airplanes were put into service.



Weights & Dimensions:

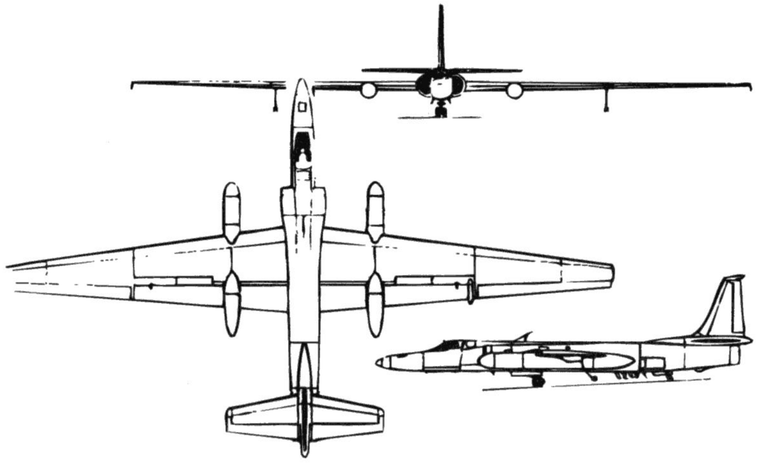
Unladen Weight:	29500 kg
Max. Takeoff Weight:	77112 kg
Height:	5.6406 m
Length:	32.7343 m
Width:	16.9375 m
Wing Area:	111.4531 m2

Performance:

Powerplant:	Two Pratt and Whitney J58-1 (JT11D-20B)continuous bleed afterburning turbojets
Max. Dry Thrust:	18424 kg
SFC (Dry Thrust):	0.68 kg/dan x h
Max. Reheat Thrust:	29484 kg
SFC (Reheat Thrust):	2.55 kg/dan x h
Max. Velocity:	Mach 3.31
Service Ceiling:	25900 m (84940 ft)
Max. Internal Fuel:	15868 kg
Max. Ferry Range:	2982 miles (4798 km)

Lockheed TR-1A

Country of Origin: US. The TR-1 is a single-seat high-altitude tactical reconnaissance aircraft derived from the U-2R.



Weights & Dimensions:

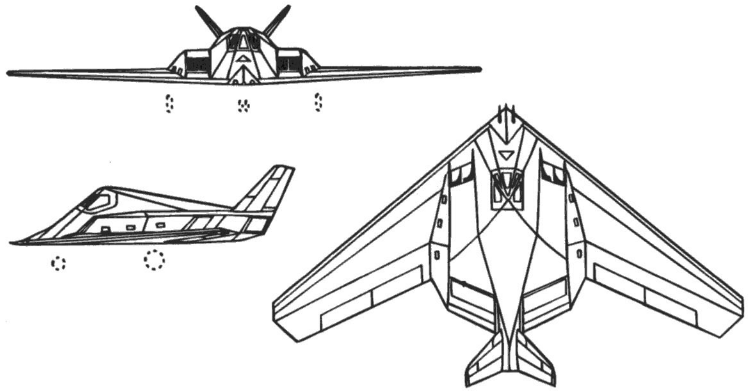
Unladen Weight:	6804 kg
Max. Takeoff Weight:	13608 kg
Height:	4.875 m
Length:	19.1953 m
Width:	31.3906 m
Wing Area:	88.0 m2

Performance:

Powerplant:	One Pratt and Whitney J75-P-13B turbojet
Max. Dry Thrust:	7710 kg
SFC (Dry Thrust):	0.363 kg/dan x h
	The jet has no reheat capability
Max. Velocity:	Mach 0.65
Service Ceiling:	27430 m (89957 ft)
Max. Internal Fuel:	4990 kg
Max. Ferry Range:	3000 miles (4827 km)

Lockheed F-117A

Country of Origin: US. As a testing ground for modern weapons, the 1973 Israeli-Egyptian War proved the effectiveness of radar- and IR-directed surface-to-air missiles. With the lessons of the war in mind, the US Air Force initiated the XST (Experimental Stealth Technology) program in the late 70s. The result was a single-seat, twin-engine fighter of unusual angular design. The sharp planes of the aircraft's body make it difficult to detect by radar. Heavily shielded air intakes and specially designed exhausts that 'dilute' hot engine gases with cold air are designed to reduce infrared emissions .



Weights & Dimensions:

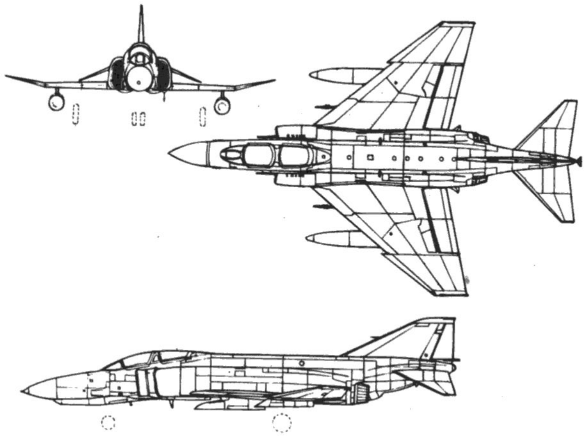
Unladen Weight:	12000 kg
Max. Takeoff Weight:	20454 kg
Height:	4.6484 m
Length:	19.0703 m
Width:	13.7187 m
Wing Area:	46.3984 m2

Performance:

Powerplant:	Two General Electric F404-GE-400 turbofans
Max. Dry Thrust:	9620 kg
SFC (Dry Thrust):	0.8499 kg/dan x h The jet has no reheat capability
Max. Velocity:	Mach 0.80
Service Ceiling:	15240 m (49980 ft)
Max. Internal Fuel:	4000 kg
Max. Ferry Range:	2000 miles (3218 km)

McDonnell Douglas F-4 Phantom II

Country of Origin: US. A US aeronautics industry success. Considered by some to be the best fighter-bomber ever, it certainly deserves special mention in fighter history. With 5,057 of these aircraft built, the Phantom was the most widely produced aircraft since the Second World War and is certainly the most numerous aircraft still serving in western arsenals.



Weights & Dimensions:

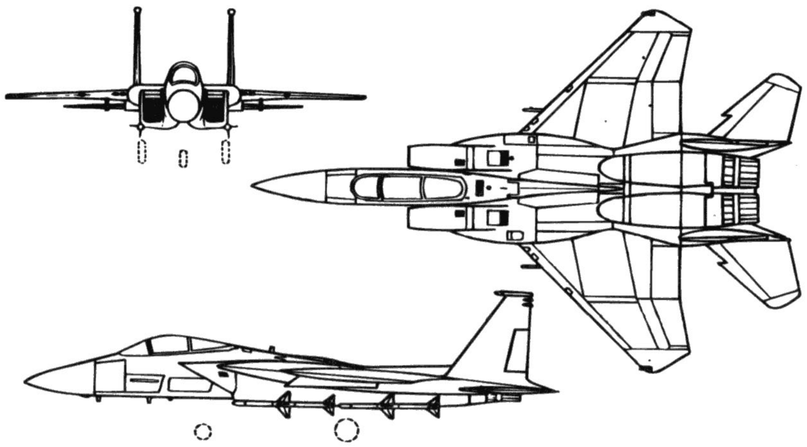
Unladen Weight:	12700 kg
Max. Takeoff Weight:	27502 kg
Height:	4.9609 m
Length:	17.7617 m
Width:	11.6992 m
Wing Area:	49.1992 m2

Performance:

Powerplant:	Two General Electric J79-17 afterburning turbojets
Max. Dry Thrust:	9639 kg
SFC (Dry Thrust):	0.8599 kg/dan x h
Max. Reheat Thrust:	15422 kg
SFC (Reheat Thrust):	2.0 kg/dan x h
Max. Velocity:	Mach 2.27
Service Ceiling:	18287 m (59972 ft)
Max. Internal Fuel:	5900 kg
Max. Ferry Range:	4184 miles (6732 km)

McDonnell Douglas F-15E Eagle

Country of Origin: US. Designed as the US Air Force's successor to the F-4 Phantom II, the F-15 first entered service in 1974. The F-15E is a two-seat air interceptor/ground attack version with the powerful F100-P-220 engines.



Weights & Dimensions:

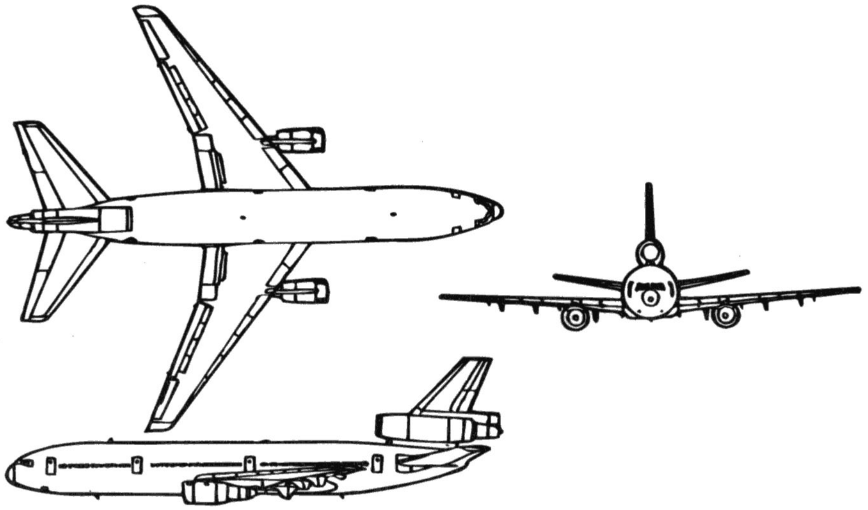
Unladen Weight:	12700 kg
Max. Takeoff Weight:	30845 kg
Height:	5.6796 m
Length:	19.4296 m
Width:	13.0507 m
Wing Area:	56.5 m2

Performance:

Powerplant:	Two General Electric F110 augmented turbofans
Max. Dry Thrust:	15774 kg
SFC (Dry Thrust):	0.68 kg/dan x h
Max. Reheat Thrust:	25400 kg
SFC (Reheat Thrust):	2.55 kg/dan x h
Max. Velocity:	Mach 2.54
Service Ceiling:	18300 m (60015 ft)
Max. Internal Fuel:	6103 kg
Max. Ferry Range:	3450 miles (5551 km)

McDonnell Douglas KC-10A

Country of Origin: US. The KC-10A is a military tanker/cargo version of popular wide-body DC-10.



Weights & Dimensions:

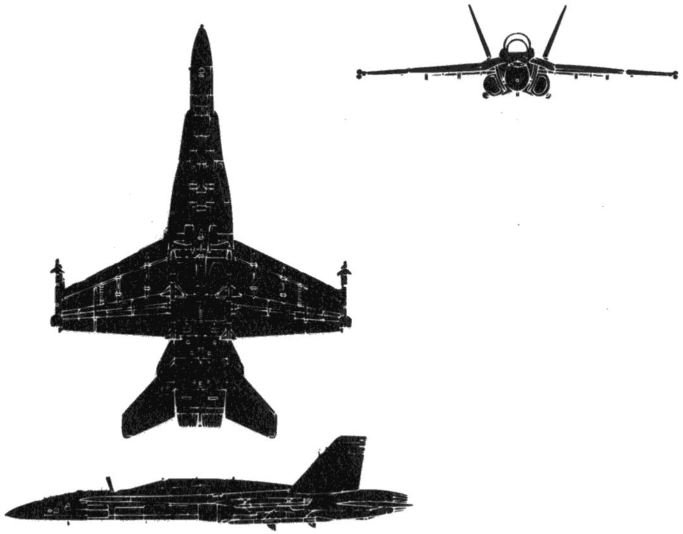
Unladen Weight:	108736 kg
Max. Takeoff Weight:	267616 kg
Height:	17.6875 m
Length:	55.4375 m
Width:	50.375 m
Wing Area:	367.6875 m2

Performance:

Powerplant:	Three General Electric CF6-50C2 turbofans
Max. Dry Thrust:	71440 kg
SFC (Dry Thrust):	0.3709 kg/dan x h The jet has no reheat capability
Max. Velocity:	Mach 0.93
Service Ceiling:	10060 m (32992 ft)
Max. Internal Fuel:	68144 kg
Max. Ferry Range:	4370 miles (7031 km)

McDonnell Douglas/Northrop F/A-18A Hornet

Country of Origin: US. Designed as the Navy's replacement for both the F-4 fighter and A-7 attack aircraft, the F-18 is a highly manoeuvrable, carrier-based multi-role aircraft.



Weights & Dimensions:

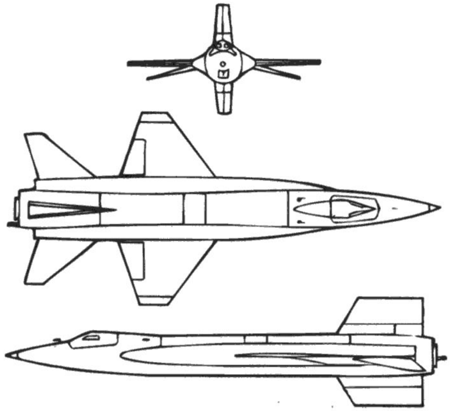
Unladen Weight:	12700 kg
Max. Takeoff Weight:	25400 kg
Height:	4.6718 m
Length:	17.0703 m
Width:	11.4296 m
Wing Area:	36.789 m2

Performance:

Powerplant:	Two General Electric F404-GE-400 augmented turbofans
Max. Dry Thrust:	9620 kg
SFC (Dry Thrust):	0.8499 kg/dan x h
Max. Reheat Thrust:	14334 kg
SFC (Reheat Thrust):	2.7548 kg/dan x h
Max. Velocity:	Mach 1.80
Service Ceiling:	15246 m (49999 ft)
Max. Internal Fuel:	4925 kg
Max. Ferry Range:	Not given

North American X-15A

Country of Origin: US. Part of the United States' experimental aircraft research program (hence the "X" designation), the X-15 aimed to meet two requirements — to reach an altitude of 72,600 m (250,000 ft) and a speed of 6437 km/h (4,000 mph). The aircraft was launched mid-air from under the wing of a Boeing B-52.



Weights & Dimensions:

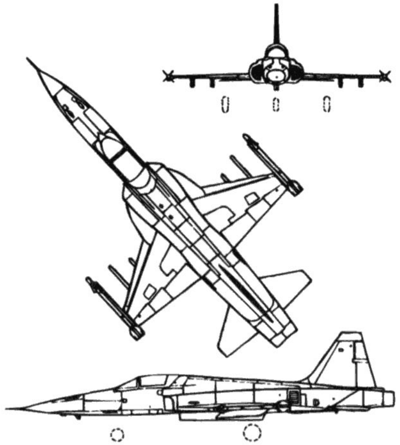
Unladen Weight:	6803 kg
Max. Takeoff Weight:	15105 kg
Height:	3.9648 m
Length:	15.246 m
Width:	6.707 m
Wing Area:	18.5937 m2

Performance:

Powerplant:	One Reaction Motors AF33(600)-32248 XLR99 single-chamber, variable throttle rocket
SFC:	13.6835 kg/dan x h
Max. Thrust:	25855 kg
Max. Velocity:	Mach 6.69
Service Ceiling:	27000 m (354188 ft)
Max. Internal Fuel:	8296 kg
Max. Ferry Range:	Not given

Northrop F-5E Tiger II

Country of Origin: US. A single-seat, multi-role interceptor/ground attack/reconnaissance aircraft, the F-5 was designed to replace the F-104 Starfighter as the United States' primary fighter export to NATO and allied countries. It is currently in use by over 25 air forces. The F-5E Tiger II is an improved version with increased thrust from two J85-GE-21 engines, aerodynamic refinements, and a superior nav-attack system.



Weights & Dimensions:

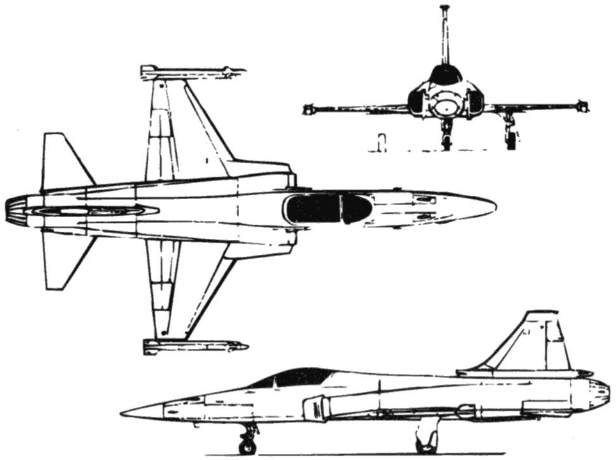
Unladen Weight:	4392 kg
Max. Takeoff Weight:	11193 kg
Height:	4.0585 m
Length:	14.6796 m
Width:	8.1289 m
Wing Area:	17.3007 m2

Performance:

Powerplant:	Two General Electric J85-GE-21A afterburning turbojets
Max. Dry Thrust:	3176 kg
SFC (Dry Thrust):	0.78 kg/dan x h
Max. Reheat Thrust:	4536 kg
SFC (Reheat Thrust):	1.88 kg/dan x h
Max. Velocity:	Mach 1.62
Service Ceiling:	15240 m (49980 ft)
Max. Internal Fuel:	4140 kg
Max. Ferry Range:	569 miles (915 km)

Northrop F-20A Tiger Shark

Country of Origin: US. The F-20 is a single-engine derivative of the F-5, with updated avionics and Mach 2 capability.



Weights & Dimensions:

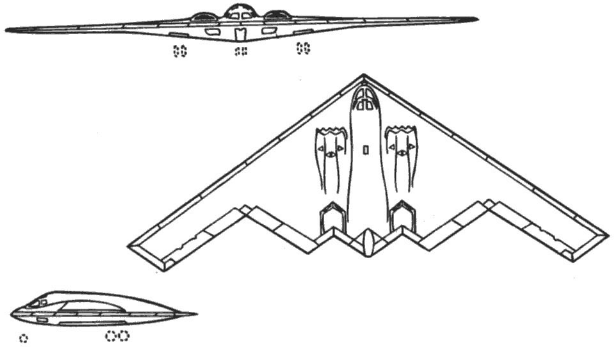
Unladen Weight:	6070 kg
Max. Takeoff Weight:	8510 kg
Height:	4.1914 m
Length:	16.4414 m
Width:	7.9804 m
Wing Area:	17.2812 m2

Performance:

Powerplant:	One General Electric F404-GE-F1G1 augmented turbofan
Max. Dry Thrust:	5330 kg
SFC (Dry Thrust):	0.78 kg/dan x h
Max. Reheat Thrust:	8000 kg
SFC (Reheat Thrust):	1.88 kg/dan x h
Max. Velocity:	Mach 2.00
Service Ceiling:	16750 m (54932 ft)
Max. Internal Fuel:	1980 kg
Max. Ferry Range:	1842 miles (2963 km)

Northrop B-2 Stealth Bomber

Country of Origin: US. A flat, flying wing without tailfins, the B-2 bomber is a radical solution to the challenge of creating a stealth aircraft. It's thin, flat profile is intended to give a poor radar signature as it penetrates enemy airspace at medium to high altitudes. The B-2 can carry both conventional and nuclear weapons.



Weights & Dimensions:

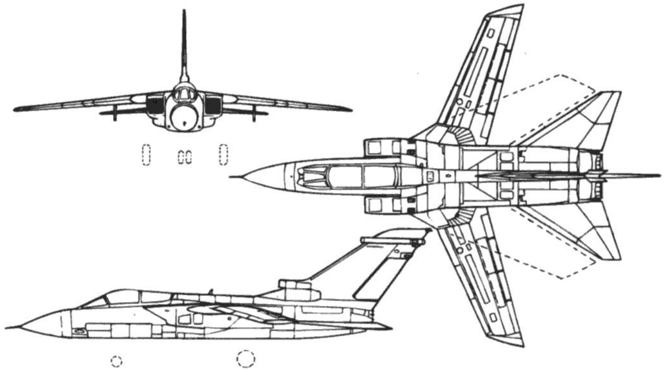
Unladen Weight:	51136 kg
Max. Takeoff Weight:	153408 kg
Height:	6.0 m
Length:	21.0312 m
Width:	52.4375 m
Wing Area:	459.0 m2

Performance:

Powerplant:	Four General Electric F118-GE-100 turbofans
Max. Dry Thrust:	34728 kg
SFC (Dry Thrust):	0.26 kg/dan x h
	The jet has no reheat capability
Max. Velocity:	Mach 0.82
Service Ceiling:	19820 m (65000 ft)
Max. Internal Fuel:	79568 kg
Max. Ferry Range:	10130 miles (16299 km)

Panavia Tornado F Mk.3 (ADV)

Country of Origin: UK, FRG, & Italy. The variable-geometry, multi-role Tornado was the product of an international consortium — Panavia — jointly owned by Britain, Germany and Italy. Design specifications called for an all-weather, long-range interceptor that could fly at low levels and operate from short or damaged runways. The ADV (Air Defence Variant) is the standard all-weather fighter version, capable of Mach 2 and equipped for inflight refuelling.



Weights & Dimensions:

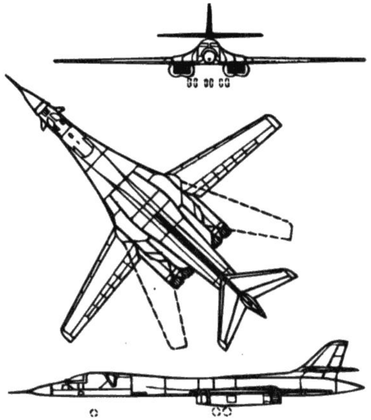
Unladen Weight:	14290 kg
Max. Takeoff Weight:	22770 kg
Height:	5.6992 m
Length:	18.0585 m
Width (Unswept):	13.8984 m
Width (Swept):	8.5898 m
Wing Area:	30.0 m2

Performance:

Powerplant:	Two Turbo-Union RB.199-34R Mk. 104 augmented turbofans
Max. Dry Thrust:	8164 kg
SFC (Dry Thrust):	0.6199 kg/dan x h
Max. Reheat Thrust:	15422 kg
SFC (Reheat Thrust):	2.25 kg/dan x h
Max. Velocity:	Mach 2.19
Service Ceiling:	12190 m (39977 ft)
Max. Internal Fuel:	5670 kg
Max. Ferry Range:	2650 miles (4263 km)

Rockwell B-1B

Country of Origin: US. Called the most expensive aircraft ever built, the B-1 development program was begun, cancelled, and restarted over the course of several US administrations. With variable-geometry wings and supersonic capabilities, the B-1 represents the latest generation of strategic bombers. The B-1B can carry both cruise missiles and Short Range Attack Missiles (SRAMs).



Weights & Dimensions:

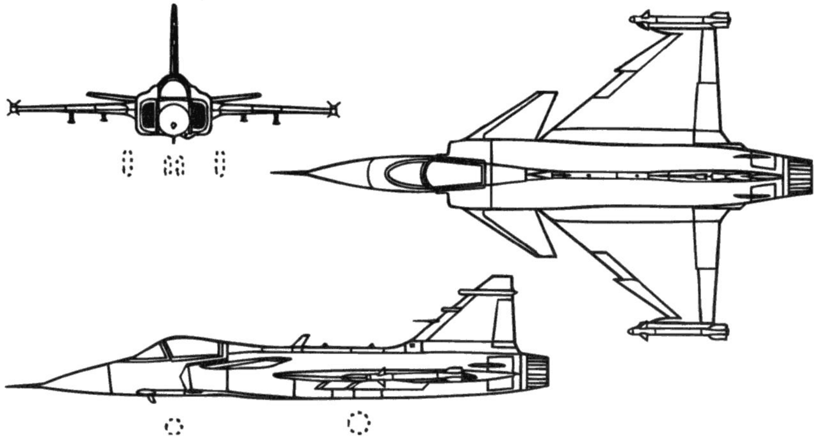
Unladen Weight:	83496 kg
Max. Takeoff Weight:	216360 kg
Height:	10.3437 m
Length:	44.7812 m
Width (Unswept):	41.6562 m
Width (Swept):	23.8125 m
Wing Area:	181.1875 m2

Performance:

Powerplant:	Four General Electric F101-GE-102 augmented turbofans
Max. Dry Thrust:	35672 kg
SFC (Dry Thrust):	0.39 kg/dan x h
Max. Reheat Thrust:	55840 kg
SFC (Reheat Thrust):	1.88 kg/dan x h
Max. Velocity:	Mach 1.25
Service Ceiling:	18290 m (59982 ft)
Max. Internal Fuel:	100000 kg
Max. Ferry Range:	7500 miles (12067 km)

Saab JAS-39 Gripen

Country of Origin: Sweden. The Gripen is the latest in a series of light but powerful fighters produced by Swedish industry. With a delta wings and canards, the Gripen is similar to its predecessor, the Saab Viggen; however, the Gripen is almost half the weight.



Weights & Dimensions:

Unladen Weight:	6350 kg
Max. Takeoff Weight:	9297 kg
Height:	3.371 m
Length:	14.0 m
Width:	8.0 m
Wing Area:	18.4335 m2

Performance:

Powerplant:	One General Electric/Volvo RM 12 augmented turbofan
Max. Dry Thrust:	5510 kg
SFC (Dry Thrust):	0.65 kg/dan x h
Max. Reheat Thrust:	8210 kg
SFC (Reheat Thrust):	2.5699 kg/dan x h
Max. Velocity:	Mach 2.19
Service Ceiling:	15240 m (49980 ft)
Max. Internal Fuel:	2000 kg
Max. Ferry Range:	3500 miles (5631 km)

NATO & Allied Air-To-Air Missiles

AIM-9P Sidewinder

Country of Origin: US. A short-range IR-guided air-to-air missile. The original Sidewinder was developed in the US in the early 50s, when infrared technology was young. Since then, the Sidewinder has undergone many variants but maintained a relative simplicity, making it cheap, sturdy, and attractive to many international customers. Experiences in Vietnam proved that the missile's seeker head was only effective when the target's exhaust was in clear view; the missile also had problems with the hot jungle floor, which tended to distract the missile from its target. Great improvements have since been made and the latest models offer better reliability.

Weights & Dimensions:

Weight:	78 kg
Body Width:	0.125 m
Span:	0.5585 m
Body Length:	3.0703 m
Fin Area:	0.2421 m2

Performance:

Max. Velocity:	Mach 3.14
Mission Time:	60s
Range:	11 miles (18 km)
Homing/Guidance Type:	IR HOMING

SA Matra Magic R.550

Country of Origin: France. A short-range IR-guided air-to-air missile. The Magic R.550 compares favourably to the US Sidewinder, with which it competes for an international market. Quick acceleration and rotating forward winglets give this missile a great degree of manoeuvrability, while it's ultra-sensitive seeker head can home in on any target within a 140° forward cone.

Weights & Dimensions:

Weight:	90 kg
Body Width:	0.1562 m
Span:	0.6679 m
Body Length:	2.7695 m
Fin Area:	0.3398 m2

Performance:

Max. Velocity:	Mach 3.00
Mission Time:	11s
Range:	6 miles (10 km)
Homing/Guidance Type:	IR HOMING

AIM-7M Sparrow

Country of Origin: US. A short-range SARH-guided air-to-air missile. Like the Sidewinder, the Sparrow has a development history that stretches back to the 40s. The 7M is the latest generation.

Weights & Dimensions:

Weight:	228 kg
Body Width:	0.2031 m
Span:	1.0195 m
Body Length:	3.6796 m
Fin Area:	0.832 m2

Performance:

Max. Velocity:	Mach 4.00
Mission Time:	85s
Range:	62 miles (100 km)
Homing/Guidance Type:	SAR HOMING

Hughes AIM-120A AMRAAM

Country of Origin: US. The Advanced Medium Range Air-to-Air Missile (AMRAAM) was designed to eventually replace the AIM-7 Sparrow entirely. The missile can acquire targets at long distance and home in via an active radar seeker head, thus eliminating the need for illumination by the attacking fighter.

Weights & Dimensions:

Weight:	148 kg
Body Width:	0.1796 m
Span:	0.3554 m
Body Length:	3.6992 m
Fin Area:	0.0625 m2

Performance:

Max. Velocity:	Mach 4.00
Mission Time:	41s
Range:	29 miles (48 km)
Homing/Guidance Type:	SAR HOMING

BAe/BGT AIM-132 ASRAAM

Country of Origin: UK and Germany. The Advanced Short Range Air-to-Air Missile (ASRAAM) is being designed to eventually replace the AIM-9 Sidewinder in Europe. Specifications call for a lightweight, highly-manoeuvrable IR-guided missile with multi-target capabilities.

Weights & Dimensions:

Weight:	62 kg
Body Width:	0.0976 m
Span:	0.4453 m
Body Length:	2.4531 m
Fin Area:	0.1914 m2

Performance:

Max. Velocity:	Mach 3.19
Mission Time:	48s
Range:	9 miles (15 km)
Homing/Guidance Type:	IR HOMING

AIM-54A Phoenix

Country of Origin: US. The most sophisticated air-to-air missile in the world, the Phoenix has a price tag — approximately $500,000 per unit — that matches its lethality. With a range of 200 km, it has the longest reach of any western missile. This missile is truly a fire and forget weapon that uses an inertial-guidance system before switching to active onboard radar when homing in for the kill. Its only limitation is the fact that only the F-14 Tomcat can carry it.

Weights & Dimensions:

Weight:	447 kg
Body Width:	0.3789 m
Span:	0.9257 m
Body Length:	4.0117 m
Fin Area:	0.5742 m2

Performance:

Max. Velocity:	Mach 5.00
Mission Time:	178s
Range:	124 miles (200 km)
Homing/Guidance Type:	ACTIVE RADAR

BAe Dynamics Skyflash

Country of Origin: UK. A medium-range radar-guided air-to-air missile developed for the RAF in the 70s. Because the RAF needed the missile to be compatible with their F-4 Phantoms, the Sky Flash was built from the basic design of the AIM-7 Sparrow, with many internal systems being completely replaced. The result was a missile better equipped to distinguish low-flying aircraft from ground objects.

Weights & Dimensions:

Weight:	193 kg
Body Width:	0.2031 m
Span:	1.0195 m
Body Length:	3.6796 m
Fin Area:	0.832 m2

Performance:

Max. Velocity:	Mach 4.00
Mission Time:	42s
Range:	31 miles (50 km)
Homing/Guidance Type:	SAR HOMING

NATO & Allied Air-To-Surface Missiles

AGM-88A HARM

Country of Origin: US. A High-speed Anti-Radiation Missile (HARM) used to destroy ground and ship-borne radar stations as well as SAM sites. The AGM-88A became operational in 1983 and was used against Libya in 1986 and Iraq in 1991.

Weights & Dimensions:

Weight:	361 kg
Body Width:	0.2539 m
Span:	1.1171 m
Body Length:	4.1718 m
Fin Area:	0.9648 m2

Performance:

Max. Velocity:	Mach 2.25
Mission Time:	42s
Range:	18 miles (30 km)
Homing/Guidance Type:	ACTIVE RADAR

Hughes AGM-65 Maverick

Country of Origin: US. The Maverick is the United States' standard air-to-surface self-guided missile for use against tanks, ships, and bunkers. With the aid of a camera installed on the missiles head, the missile guides itself to the selected target, leaving the pilot the option of breaking off. Since its appearance in 1972, the Maverick has undergone many developments including Imaging Infra-Red (IIR) and laser-guided variants.

Weights & Dimensions:

Weight:	210 kg
Body Width:	0.3046 m
Span:	0.7187 m
Body Length:	2.4882 m
Fin Area:	0.2968 m2

Performance:

Max. Velocity:	Mach 1.50
Mission Time:	31 s
Range:	9 miles (16 km)
Homing/Guidance Type:	ACTIVE RADAR

Rockwell AGM-114 Hellfire

Country of Origin: US. The Hellfire is a laser-guided air-to-surface missile, originally developed as a helicopter anti-tank weapon but currently being developed for use by fixed-wing aircraft. The Hellfire saw extensive use in the 1991 Gulf War.

Weights & Dimensions:

Weight:	**45 kg**
Body Width:	0.1796 m
Span:	0.3515 m
Body Length:	1.625 m
Fin Area:	0.0585 m2

Performance:

Max. Velocity:	Mach 1.16
Mission Time:	57s
Range:	12 miles (20 km)
Homing/Guidance Type:	IR HOMING

SA Matra Durandal

Country of Origin: France. The Durandal is designed to inflict maximum damage on hard targets such as concrete hangars and runways. Upon release, the weapon deploys a parachute, causing the warhead to point straight down at the target. A high acceleration rocket then ignites and the weapon is punched into the target — reportedly up to 15 inches through solid concrete. The warhead detonates soon afterward. Eleven countries beside France have bought the Durandal, including the US.

Weights & Dimensions:

Weight:	195 kg
Body Width:	0.2226 m
Span:	0.4296 m
Body Length:	2.6992 m
Fin Area:	0.0898 m2

Performance:

Max. Velocity:	Mach 1.00
Mission Time:	2s
Range:	2 miles (4 km)
Homing/Guidance Type:	Unguided

Martin Marietta Bullpup

Country of Origin: US. A short-range radio-controlled air-to-surface missile.

Weights & Dimensions:

Weight:	259 kg
Body Width:	0.3046 m
Span:	0.9375 m
Body Length:	3.1992 m
Fin Area:	0.6015 m2

Performance:

Max. Velocity:	Mach 2.39
Mission Time:	16 s
Range:	6 miles (11 km)
Homing/Guidance Type:	ACTIVE RADAR

McDonnell Douglas Astronautics AGM-84A Harpoon

Country of Origin: US. A long-range radar-guided air-to-surface missile. This fire-and-forget missile relies on inertial-guidance while skimming the sea and switches to active radar as it approaches the target.

Weights & Dimensions:

Weight:	526 kg
Body Width:	0.3437 m
Span:	0.7617 m
Body Length:	3.8398 m
Fin Area:	0.3203 m2

Performance:

Max. Velocity:	Mach 0.75
Mission Time:	405s
Range:	57 miles (92 km)
Homing/Guidance Type:	ACTIVE RADAR

Aerospatiale AM.39 Exocet

Country of Origin: France. Originally a ship-launched missile, the Exocet was later developed into an air-launched missile — the AM.38 —to be carried by French attack aircraft. The AM.39 is an improved version. Shorter in length and with a better propulsion system, it's more manoeuvrable than it's predecessor. The Exocet relies on inertial guidance during mid-course and active radar for terminal homing. The Argentine Air Force used the Exocet extensively — and to some degree, successfully — in the Falklands War.

Weights & Dimensions:

Weight:	655 kg
Body Width:	0.3515 m
Span:	1.1015 m
Body Length:	4.6875 m
Fin Area:	0.8242 m2

Performance:

Max. Velocity:	Mach 0.84
Mission Time:	295s
Range:	26 miles (43 km)
Homing/Guidance Type:	ACTIVE RADAR

BAe Dynamics Sea Eagle

Country of Origin: UK. A long-range radar-guided air-to-surface missile designed to replace the Anglo-French Martel. Like the Harpoon and Exocet, the Sea Eagle skims the sea after launch, turning on active radar just as it approaches the target.

Weights & Dimensions:

Weight:	550 kg
Body Width:	0.3984 m
Span:	1.1992 m
Body Length:	4.1015 m
Fin Area:	0.9609 m2

Performance:

Max. Velocity:	Mach 0.89
Mission Time:	200 s
Range:	37 miles (60 km)
Homing/Guidance Type:	ACTIVE RADAR

MBB Kormoran

Country of Origin: Germany. A long-range radar-guided air-to-surface missile. The Kormoran skims the sea after launch, switches to active radar as it closes and descends in the terminal phase to pierce the target just above the waterline. Once the missile is lodged in the hull, the delayed action fuse explodes the warhead, thus inflicting maximum damage on the target.

Weights & Dimensions:

Weight: 600 kg
Body Width: 0.3398 m
Span: 1.0 m
Body Length: 4.3984 m
Fin Area: 0.6601 m2

Performance:

Max. Velocity: Mach 0.94
Mission Time: 117 s
Range: 22 miles (37 km)
Homing/Guidance Type: ACTIVE RADAR

NATO & Allied Bombs

Mk 82 Bomb

Country of Origin: US. A general-purpose bomb developed in the 50s for use by US Navy and Air Force aircraft.

Weights & Dimensions:

Weight: 454 kg
Body Width: 273 mm
Body Length: 2.21 m
Homing/Guidance Type: FREE FALL

Mk 83 Bomb

Country of Origin: US. A general-purpose bomb developed in the 50s for use by US Navy and Air Force aircraft, almost one third larger than and twice as heavy as the Mk 82.

Weights & Dimensions:

Weight: 454 kg
Body Width: 350 mm
Body Length: 3.0 m
Homing/Guidance Type: FREE FALL

Mk 84 Bomb

Country of Origin: US. A general-purpose bomb developed in the 50s for use by US Navy and Air Force aircraft, almost twice as large and double the weight of the Mk 82.

Weights & Dimensions:

Weight: 454 kg
Body Width: 460 mm
Body Length: 3.84 m
Homing/Guidance Type: FREE FALL

Paveway LGB Smart Bomb

Country of Origin: US. A laser-guided glide bomb. Though it falls like a conventional bomb, a laser installed on the Paveway reflects a beam off the target, which in turn is "read" by the bomb's guidance computer. This then makes appropriate adjustments to the bomb's tailfins, thus affecting the weapon's descent toward the target.

Weights & Dimensions:

Weight:	582 kg
Body Width:	0.914 m
Span:	1.6015 m
Body Length:	3.5781 m
Fin Area:	1.1015 m2
Homing/Guidance Type:	LASER GUIDED

Rockeye II Mk 20 Cluster Bomb

Country of Origin: US. The Rockeye is a large bomb containing 247 sub-munitions. As it falls, a small fuse opens the bomb, spreading the smaller bombs over a wide area. As an area-effect weapon, the cluster bomb doesn't require precise aiming.

Weights & Dimensions:

Weight:	454 kg
Body Width:	335 mm
Body Length:	2.4 m
Homing/Guidance Type:	FREE FALL

Thomson Brandt Armaments/SA Matra BLG 66 Belouga Bomb

Country of Origin: France. The Belouga Bomb is a cluster-type weapon containing a number of smaller sub-munitions. After release, the bomb descends on a parachute, dispersing grenades at an even rate. Since the bomblets cover a wide area, this weapon is especially effective in the anti-tank role and against airfields.

Weights & Dimensions:

Weight:	305 kg
Body Width:	366 mm
Body Length:	3.3 m
Homing/Guidance Type:	FREE FALL

Hughes Wasp

Country of Origin: US. Developed as part of the US Air Force's WAAM (Wide-Area Anti-Armor Munitions) programme, the Wasp is an inexpensive yet effective battlefield interdiction weapon. Each Wasp pod contains 12 fire-and-forget missiles in 6 launching tubes. Once launched, the missile climbs or descends to altitude and begins an active radar search for metal ground targets.

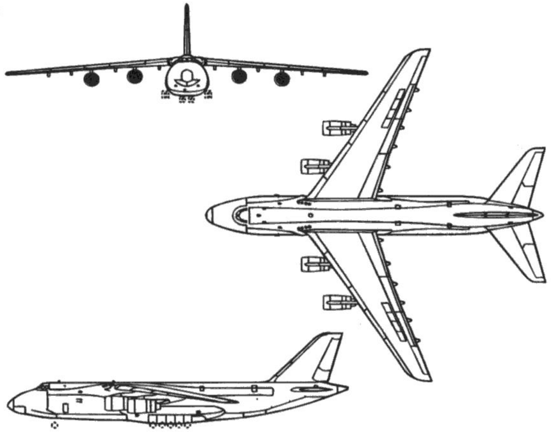
Weights & Dimensions:

Weight:	651 kg
Body Width:	203 mm
Body Length:	1.5 m
Homing/Guidance Type:	FREE FALL

Soviet Airplanes

Antonov An-124 CONDOR

Once the largest aircraft in the world, the An-124 is one of the latest in a series of massive, record-breaking Soviet transport airplanes. The An-124's whopping 150,000 kg maximum payload can be loaded from both the front — through a hinged nose — and rear. A unique 28 wheel undercarriage allows it to take off and land even in severe runway conditions.



Weights & Dimensions:

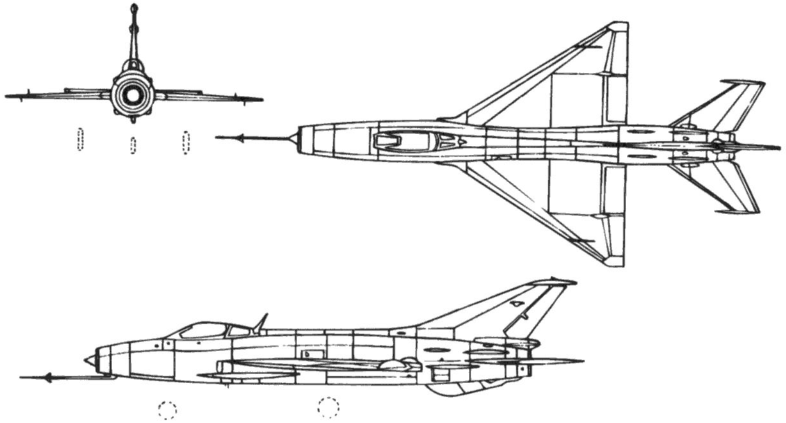
Unladen Weight:	150000 kg
Max. Takeoff Weight:	405000 kg
Height:	22.5 m
Length:	69.5 m
Width:	73.2812 m
Wing Area:	628.0 m2

Performance:

Powerplant:	Four Lotarev D-18T turbofans
Max. Dry Thrust:	93720 kg
SFC (Dry Thrust):	0.552 kg/dan x h
	The jet has no reheat capability
Max. Velocity:	Mach 0.80
Service Ceiling:	15000 m (49193 ft)
Max. Internal Fuel:	175000 kg
Max. Ferry Range:	10250 miles (16492 km)

Mikoyan-Gurevich MiG-21BIS FISHBED N

The MiG-15's poor showing in the Korean War led to the development of the MiG-21, a short-range air-superiority fighter destined to become a triumph for Soviet exports. It's small airframe and short delta wings give it great power and manoeuvrability — its only disadvantages are a short mission range and the woefully few number of weapons and systems it can carry. Over 4,000 MiG-21's serve in no fewer than 28 air forces worldwide.



Weights & Dimensions:

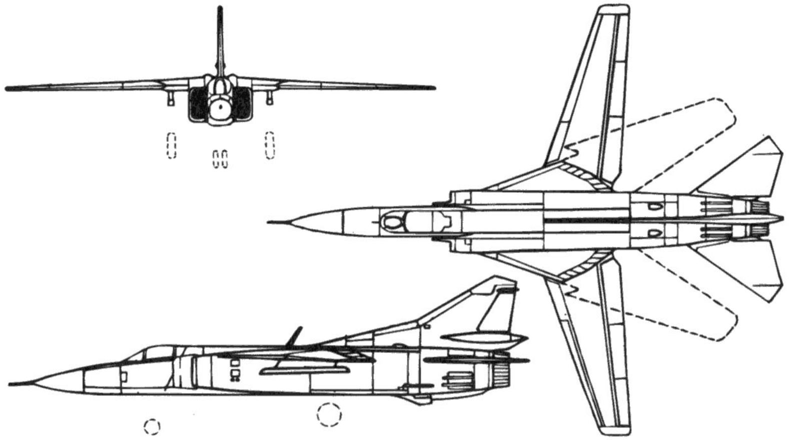
Unladen Weight:	6120 kg
Max. Takeoff Weight:	8950 kg
Height:	4.5 m
Length:	15.7617 m
Width:	7.1484 m
Wing Area:	22.9492 m2

Performance:

Powerplant:	One Tumanskii R-25 afterburning turbojet
Max. Dry Thrust:	5213 kg
SFC (Dry Thrust):	0.8599 kg/dan x h
Max. Reheat Thrust:	7500 kg
SFC (Reheat Thrust):	2.0 kg/dan x h
Max. Velocity:	Mach 2.10
Service Ceiling:	18000 m (59031 ft)
Max. Internal Fuel:	2260 kg
Max. Ferry Range:	683 miles (1098 km)

Mikoyan-Gurevich MiG-23 FLOGGER G

Since its appearance in 1966, the MiG-23 has been a standard front-line Soviet fighter/interceptor. It's design represented a radical departure from the simplicity of the MiG-21, the most obvious being its variable-geometry wings. There have been many variants of the MiG-23, many of which have been sold to Czechoslovakia, Egypt, Iraq, Libya, and Syria.



Weights & Dimensions:

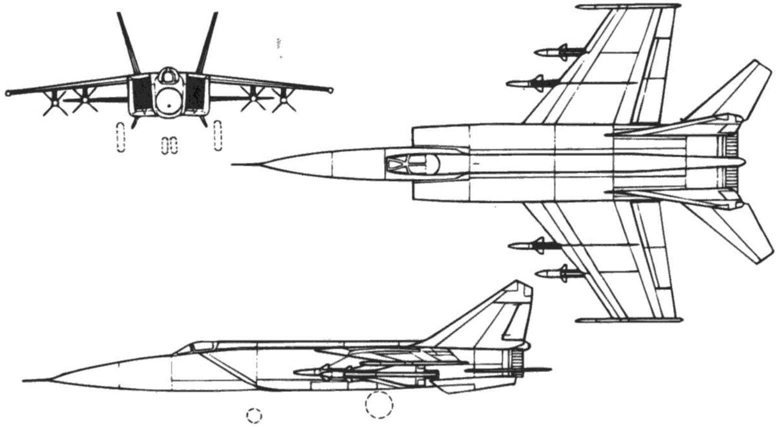
Unladen Weight:	11340 kg
Max. Takeoff Weight:	20100 kg
Height:	4.371 m
Length:	16.8007 m
Width (Unswept):	14.25 m
Width (Swept):	8.3789 m
Wing Area:	27.2617 m2

Performance:

Powerplant:	One Tumanskii R-29B augmented turbofan
Max. Dry Thrust:	8000 kg
SFC (Dry Thrust):	0.8599 kg/dan x h
Max. Reheat Thrust:	11500 kg
SFC (Reheat Thrust):	2.0 kg/dan x h
Max. Velocity:	Mach 2.30
Service Ceiling:	16000 m (52472 ft)
Max. Internal Fuel:	4500 kg
Max. Ferry Range:	1060 miles (1705 km)

Mikoyan-Gurevich MiG-25 FOXBAT E

The MiG-25 interceptor was conceived as a direct response to the threat posed by the North American B-70 Valkyrie, a strategic bomber that could fly Mach 3 at very high altitudes. The B-70 programme was eventually cancelled, but Soviet designers continued work on this high-altitude, high-performance interceptor. The MiG-25 can fly at Mach 3 and climb to altitudes of 24,385 m (80,000 ft).



Weights & Dimensions:

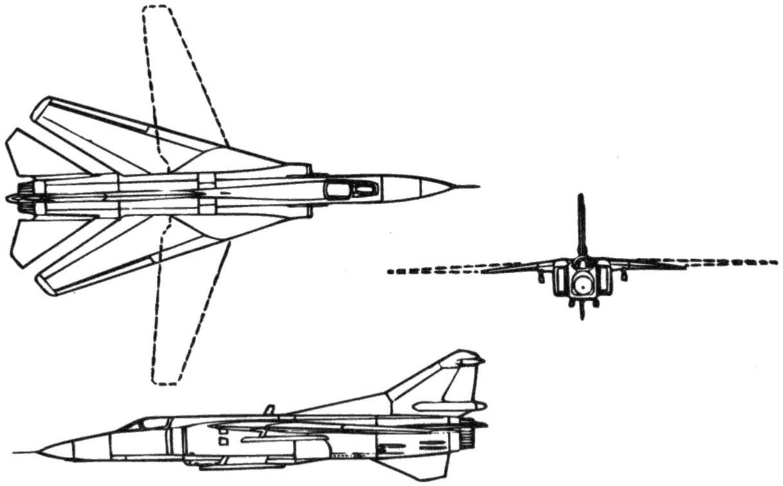
Unladen Weight:	19999 kg
Max. Takeoff Weight:	36197 kg
Height:	6.1015 m
Length:	23.8203 m
Width:	13.9414 m
Wing Area:	61.5195 m2

Performance:

Powerplant:	Two Tumanskii R-31F afterburning turbojets
Max. Dry Thrust:	17500 kg
SFC (Dry Thrust):	0.68 kg/dan x h
Max. Reheat Thrust:	28000 kg
SFC (Reheat Thrust):	2.55 kg/dan x h
Max. Velocity:	Mach 3.19
Service Ceiling:	26997 m (88537 ft)
Max. Internal Fuel:	14320 kg
Max. Ferry Range:	1448 miles (2329 km)

Mikoyan-Gurevich MiG-27 FLOGGER J

The MiG-27 is a dedicated attack version of the MiG-23, with a heavily-armoured nose to protect it from ground fire, a lighter powerplant for use at low altitudes, and additional pylons for a greater weapon load.



Weights & Dimensions:

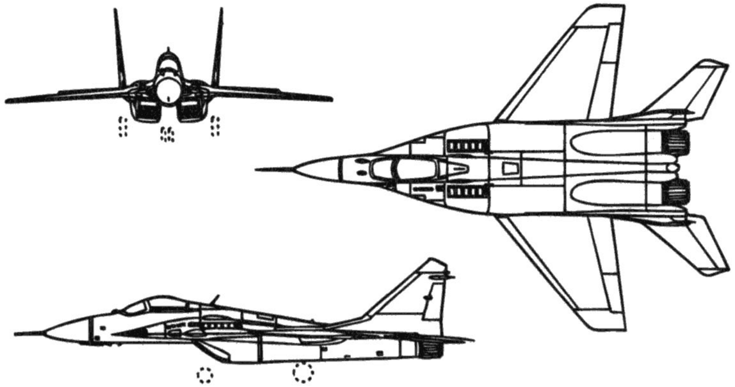
Unladen Weight:	10790 kg
Max. Takeoff Weight:	20410 kg
Height:	4.371 m
Length:	16.8007 m
Width (Unswept):	14.25 m
Width (Swept):	8.3789 m
Wing Area:	27.2617 m2

Performance:

Powerplant:	One Tumanskii R-29-300 augmented turbofan
Max. Dry Thrust:	6500 kg
SFC (Dry Thrust):	0.8599 kg/dan x h
Max. Reheat Thrust:	8130 kg
SFC (Reheat Thrust):	2.0 kg/dan x h
Max. Velocity:	Mach 1.60
Service Ceiling:	16000 m (52472 ft)
Max. Internal Fuel:	4500 kg
Max. Ferry Range:	1060 miles (1705 km)

Mikoyan-Gurevich MiG-29 FULCRUM A

Following the lead of western powers, the Soviets designed a lightweight multi-role fighter of their own to combat the likes of the F-15 and F/A-18.



Weights & Dimensions:

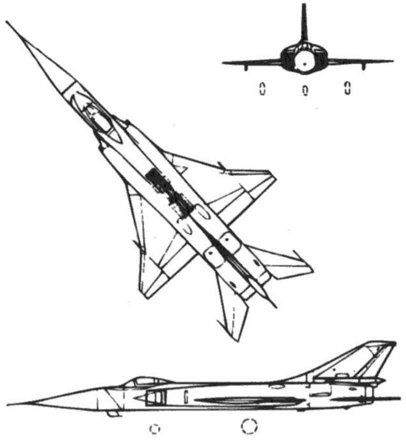
Unladen Weight:	8165 kg
Max. Takeoff Weight:	16330 kg
Height:	4.5 m
Length:	17.0 m
Width:	11.5 m
Wing Area:	36.789 m2

Performance:

Powerplant:	Two Tumanskii R-33D augmented turbofans
Max. Dry Thrust:	10200 kg
SFC (Dry Thrust):	0.8499 kg/dan x h
Max. Reheat Thrust:	16600 kg
SFC (Reheat Thrust):	2.7548 kg/dan x h
Max. Velocity:	Mach 2.30
Service Ceiling:	15240 m (49980 ft)
Max. Internal Fuel:	4425 kg
Max. Ferry Range:	Not given

Sukhoi Su-21 FLAGON F

The Su-21 is a single-seat interceptor. Though it's been in service for years, it's nevertheless extremely fast. However, it lacks manoeuvrability and also requires very long runways for takeoff and landing.



Weights & Dimensions:

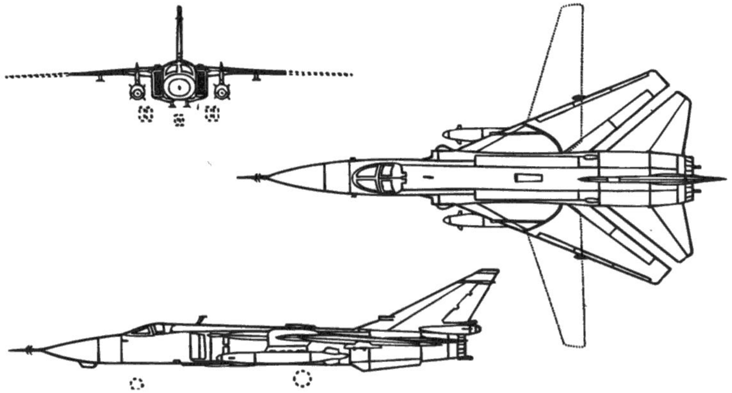
Unladen Weight:	12250 kg
Max. Takeoff Weight:	18780 kg
Height:	5.0312 m
Length:	21.9492 m
Width:	10.5195 m
Wing Area:	35.7812 m2

Performance:

Powerplant:	Two Tumanskii R-13F2-300 afterburning turbojets
Max. Dry Thrust:	10212 kg
SFC (Dry Thrust):	0.68 kg/dan x h
Max. Reheat Thrust:	14400 kg
SFC (Reheat Thrust):	2.55 kg/dan x
Max. Velocity:	Mach 2.50
Service Ceiling:	20000 m (65590 ft)
Max. Internal Fuel:	4990 kg
Max. Ferry Range:	1400 miles (2252 km)

Sukhoi Su-24 FENCER D

The Su-24 is an excellent multi-role fighter particularly well-suited for ground attack missions. Similar in almost all respects to the General Dynamics F-111, its variable-geometry wings give it excellent handling over the deck as well as a Mach 2+ top speed at altitude. Sophisticated avionics and a high payload make the Su-24 a lethal aircraft.



Weights & Dimensions:

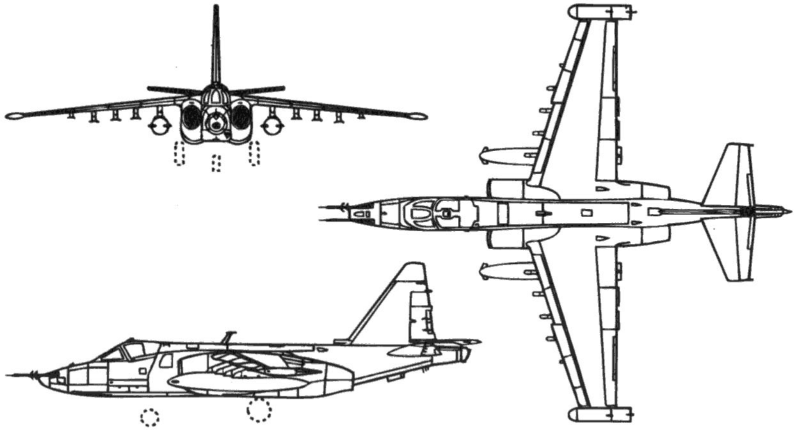
Unladen Weight:	19000 kg
Max. Takeoff Weight:	41000 kg
Height:	5.5 m
Length:	22.0 m
Width (Unswept):	17.25 m
Width (Swept):	10.3007 m
Wing Area:	46.3984 m2

Performance:

Powerplant:	Two Tumanskii R-29B afterburning turbojets
Max. Dry Thrust:	16040 kg
SFC (Dry Thrust):	0.66 kg/dan x h
Max. Reheat Thrust:	23000 kg
SFC (Reheat Thrust):	2.78 kg/dan x h
Max. Velocity:	Mach 2.39
Service Ceiling:	17502 m (57398 ft)
Max. Internal Fuel:	10400 kg
Max. Ferry Range:	4000 miles (6436 km)

Sukhoi Su-25 FROGFOOT

The Su-25 fulfils the same role as the Fairchild A-10 — a heavily-armoured close support aircraft. It's design is very similar to that of the Northrop A-9 (which lost the USAF contract to the A-10), with twin engines under two broad shoulder-wings. The Su-25 served the Soviets in Afghanistan and the Iraqis in the Iran-Iraq War.



Weights & Dimensions:

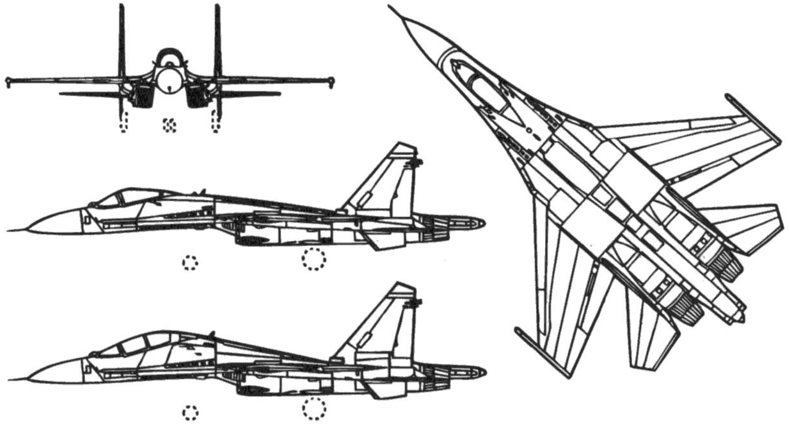
Unladen Weight:	9500 kg
Max. Takeoff Weight:	20000 kg
Height:	4.8007 m
Length:	15.1992 m
Width:	14.1992 m
Wing Area:	37.6015 m2

Performance:

Powerplant:	Two Tumanskii non-afterburning turbojets
Max. Dry Thrust:	8200 kg
SFC (Dry Thrust):	0.6199 kg/dan x h
	The jet has no reheat capability
Max. Velocity:	Mach 0.55
Service Ceiling:	3050 m (10002 ft)
Max. Internal Fuel:	4000 kg
Max. Ferry Range:	2895 miles (4658 km)

Sukhoi Su-27 FLANKER B

Designed to intercept low-flying aircraft and cruise missiles, the Su-27 is aerodynamically similar to the MiG-29, only heavier and more powerful.



Weights & Dimensions:

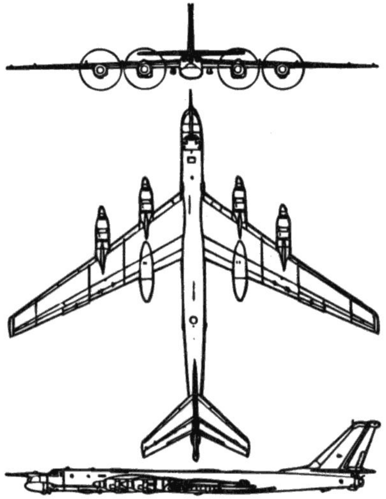
Unladen Weight:	14400 kg
Max. Takeoff Weight:	28800 kg
Height:	5.5 m
Length:	21.6015 m
Width:	14.6992 m
Wing Area:	51.0 m2

Performance:

Powerplant:	Two L'Yulka RD-32 augmented turbofans
Max. Dry Thrust:	18140 kg
SFC (Dry Thrust):	0.68 kg/dan x h
Max. Reheat Thrust:	27220 kg
SFC (Reheat Thrust):	2.55 kg/dan x h
Max. Velocity:	Mach 2.30
Service Ceiling:	18300 m (60015 ft)
Max. Internal Fuel:	6500 kg
Max. Ferry Range:	2500 miles (4022 km)

Tupolev Tu-95 BEAR G

The Tu-95 Bear is a long-range strategic bomber/reconnaissance aircraft which first entered service in 1955. The Bear G can carry two AS-4 Kitchen missiles.



Weights & Dimensions:

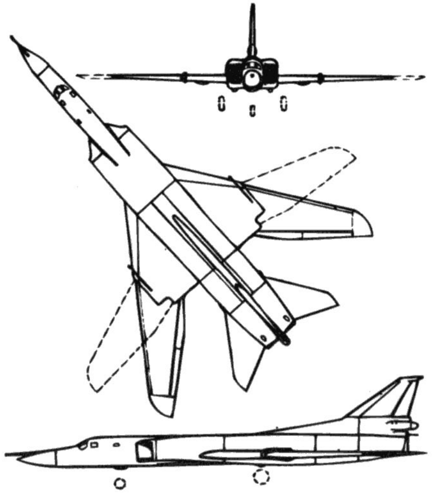
Unladen Weight:	81000 kg
Max. Takeoff Weight:	188000 kg
Height:	12.0937 m
Length:	49.5 m
Width:	51.1875 m
Wing Area:	310.5 m2

Performance:

Powerplant:	Four 14795 ehp Kuznetsov NK-12MV turboprops
Max. Velocity:	Mach 0.80
Service Ceiling:	12190 m (39977 ft)
Max. Internal Fuel:	30000 kg
Max. Ferry Range:	7800 miles (12550 km)

Tupolev Tu-26 BACKFIRE B

The Tu-26 is a bomber/reconnaissance aircraft capable of Mach 2. Its variable-geometry wings give it exceptional long-range strike capabilities.



Weights & Dimensions:

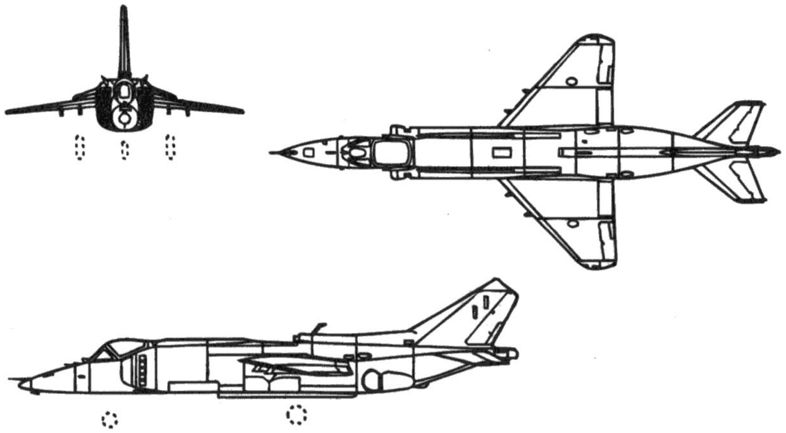
Unladen Weight:	54000 kg
Max. Takeoff Weight:	122500 kg
Height:	9.0 m
Length:	42.0 m
Width (Unswept):	35.0 m
Width (Swept):	28.0 m
Wing Area:	170.0 m2

Performance:

Powerplant:	Two Kuznetsov NK-144 variant augmented turbofans
Max. Dry Thrust:	30000 kg
SFC (Dry Thrust):	0.39 kg/dan x h
Max. Reheat Thrust:	42000 kg
SFC (Reheat Thrust):	1.88 kg/dan x h
Max. Velocity:	Mach 1.90
Service Ceiling:	15240 m (49980 ft)
Max. Internal Fuel:	57000 kg
Max. Ferry Range:	5560 miles (8946 km)

Yakovlev Yak-38 MP FORGER A

This single-seat carrier-borne STOVL fighter was designed solely to give the Soviet Navy a sea-borne air arm. It possesses three engines, the two smaller Koliesov turbojets for take off and landing, and the single Lyulka for horizontal thrust.



Weights & Dimensions:

Unladen Weight:	7300 kg
Max. Takeoff Weight:	11565 kg
Height:	3.3515 m
Length:	16.0 m
Width:	7.4882 m
Wing Area:	18.5 m2

Performance:

Powerplant:	One 7938 kg Lyulka vectored-thrust turbojet and two 3630 kg Koliesov lifting jets
Max. Dry Thrust:	7938 kg
SFC (Dry Thrust):	0.78 kg/dan x h The jet has no reheat capability
Max. Velocity:	Mach 0.94
Service Ceiling:	11887 m (38983 ft)
Max. Internal Fuel:	2270 kg
Max. Ferry Range:	1800 miles (2896 km)

Soviet Air-To-Air Missiles

AA-2 ATOLL

The first AA-2 was a copy of an early Sidewinder, but since then it has been redesigned and improved by Soviet developers. Nonetheless, the Atoll is accurate only when fired directly at the targeted aircraft's engines.

Weights & Dimensions:

Weight:	70 kg
Body Width:	0.121 m
Span:	0.5312 m
Body Length:	2.8515 m
Fin Area:	0.2187 m2

Performance:

Max. Velocity:	Mach 2.50
Mission Time:	44 s
Range:	19 miles (32 km)
Homing/Guidance Type:	SAR HOMING

AA-3 ANAB

The AA-3 is a medium-range radar-guided air-to-air missile.

Weights & Dimensions:

Weight:	275 kg
Body Width:	0.2812 m
Span:	1.2968 m
Body Length:	4.1015 m
Fin Area:	1.3242 m2

Performance:

Max. Velocity:	Mach 2.50
Mission Time:	29s
Range:	13 miles (21 km)
Homing/Guidance Type:	SAR HOMING

AA-6 ACRID

The medium-range radar-guided AA-6 was designed with the MiG-25 to meet the threat posed by the North American B-70 Valkyrie.

Weights & Dimensions:

Weight:	800 kg
Body Width:	0.3984 m
Span:	2.25 m
Body Length:	6.1015 m
Fin Area:	4.164 m2

Performance:

Max. Velocity:	Mach 4.00
Mission Time:	68s
Range:	49 miles (80 km)
Homing/Guidance Type:	SAR HOMING

AA-7 APEX

The AA-7 is a standard Soviet medium-range radar-guided air-to-air missile.

Weights & Dimensions:

Weight:	320 kg
Body Width:	0.1953 m
Span:	1.0 m
Body Length:	4.6015 m
Fin Area:	0.8046 m2

Performance:

Max. Velocity:	Mach 3.00
Mission Time:	45s
Range:	24 miles (40 km)
Homing/Guidance Type:	SAR HOMING

AA-8 APHID

A short-range IR-guided air-to-air missile designed to replace the AA-2 Atoll. Later versions of the Aphid were truly 'all-aspect', that is, they could could be launched from any direction at the targeted aircraft and stand a reasonable chance of hitting.

Weights & Dimensions:

Weight:	55 kg
Body Width:	0.121 m
Span:	0.3984 m
Body Length:	2.1484 m
Fin Area:	0.1132 m2

Performance:

Max. Velocity:	Mach 3.00
Mission Time:	9s
Range:	4 miles (8 km)
Homing/Guidance Type:	IR HOMING

AA-9 AMOS

The latest Soviet long-range radar-guided air-to-air missile. Compared to all earlier Soviet missiles, the AA-9 is strikingly different in shape, thus suggesting that it's a direct copy of the AIM-54 Phoenix.

Weights & Dimensions:

Weight:	560 kg
Body Width:	0.5703 m
Span:	1.4218 m
Body Length:	4.5585 m
Fin Area:	1.207 m2

Performance:

Max. Velocity:	Mach 3.00
Mission Time:	148 s
Range:	80 miles (130 km)
Homing/Guidance Type:	ACTIVE RADAR

AA-10 ALAMO

The latest Soviet medium-range radar-guided air-to-air missile, carried exclusively by state-of-the-art aircraft such as the MiG-29 and Su-27.

Weights & Dimensions:

Weight:	420 kg
Body Width:	0.5703 m
Span:	1.4218 m
Body Length:	4.5585 m
Fin Area:	1.207 m2

Performance:

Max. Velocity:	Mach 3.00
Mission Time:	36 s
Range:	19 miles (32 km)
Homing/Guidance Type:	ACTIVE RADAR

AA-11 ARCHER

The latest Soviet short-range air-to-air missile. Due to several sets of fins and control vanes, the missile is thought to be highly manoeuvrable. The AA-11 is carried exclusively by state-of-the-art aircraft such as the MiG-29 and Su-27.

Weights & Dimensions:

Weight:	280 kg
Body Width:	0.5703 m
Span:	1.4218 m
Body Length:	4.5585 m
Fin Area:	1.207 m2

Performance:

Max. Velocity:	Mach 3.00
Mission Time:	24 s
Range:	13 miles (21 km)
Homing/Guidance Type:	ACTIVE RADAR

Soviet Air-To-Surface Missiles

AS-4 KITCHEN

Begun in the early 60s and developed throughout the 70s, the AS-4 is a long-range radar-guided air-to-surface missile. The missile uses inertial guidance during mid-flight and switches to active radar in the terminal phase.

Weights & Dimensions:

Weight:	5900 kg
Body Width:	0.871 m
Span:	2.5664 m
Body Length:	11.2929 m
Fin Area:	1.6914 m2

Performance:

Max. Velocity:	Mach 3.50
Mission Time:	446s
Range:	285 miles (460 km)
Homing/Guidance Type:	ACTIVE RADAR

AS-6 KINGFISH

The AS-6 Kingfish is an improved version of the AS-4 Kitchen. Like the AS-4, the Kingish uses inertial guidance during mid-flight and switches to active radar in the terminal phase.

Weights & Dimensions:

Weight:	5000 kg
Body Width:	0.746 m
Span:	2.3476 m
Body Length:	9.9921 m
Fin Area:	1.7539 m2

Performance:

Max. Velocity:	Mach 3.00
Mission Time:	458s
Range:	251 miles (405 km)
Homing/Guidance Type:	ACTIVE RADAR

AS-7 Kerry

A short-range radio-controlled air-to-surface missile.

Weights & Dimensions:

Weight:	1200 kg
Body Width:	0.6093 m
Span:	1.4375 m
Body Length:	4.9765 m
Fin Area:	0.5937 m2

Performance:

Max. Velocity:	Mach 1.50
Mission Time:	155s
Range:	49 miles (80 km)
Homing/Guidance Type:	ACTIVE RADAR

AS-9 KYLE

Developed in the late 60s, the AS-9 is a medium-range anti-radar air-to-surface missile. The Kyle has been exported to many countries including Iraq and Libya.

Weights & Dimensions:

Weight:	451 kg
Body Width:	0.2539 m
Span:	1.1171 m
Body Length:	4.1718 m
Fin Area:	0.9648 m2

Performance:

Max. Velocity:	Mach 2.25
Mission Time:	52s
Range:	22 miles (37 km)
Homing/Guidance Type:	ACTIVE RADAR

AS-14 KEDGE

The AS-14 is a medium-range anti-radar air-to-surface missile that can be fired from low altitudes, thus helping the pilot avoid radar detection.

Weights & Dimensions:

Weight:	420 kg
Body Width:	0.3046 m
Span:	0.7187 m
Body Length:	2.4882 m
Fin Area:	0.2968 m2

Performance:

Max. Velocity:	Mach 1.50
Mission Time:	62s
Range:	19 miles (32 km)
Homing/Guidance Type:	ACTIVE RADAR

Soviet Bombs

Mk 82 Bomb

The Soviet version of the Mk 82.

Weights & Dimensions:

Weight:	454 kg
Body Width:	273 mm
Body Length:	2.21 m
Homing/Guidance Type:	FREE FALL

Mk 83 Bomb

The Soviet version of the Mk 83.

Weights & Dimensions:

Weight:	454 kg
Body Width:	350 mm
Body Length:	3.0 m
Homing/Guidance Type:	FREE FALL

Mk 84 Bomb

The Soviet version of the Mk 84.

Weights & Dimensions:

Weight:	454 kg
Body Width:	460 mm
Body Length:	3.84 m
Homing/Guidance Type:	FREE FALL

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